Canada Alberta

FOREST RESOURCE DEVELOPMENT AGREEMENT
ENTENTE SUR LA MISE EN VALEUR DES RESSOURCES FORESTIERES

Canada Alberta

89-01402/

The Canada-Alberta Forest Resource Development Agreement is a subsidiary agreement of the Canada-Alberta Economic and Regional Development Agreement, which provides coordination and cooperation between the governments of Alberta and Canada in areas of Alberta's economic development.

The Canada-Alberta Forest Resource Development Agreement is funded equally by the governments of Canada and Alberta, from April 1, 1984, to March 31, 1989.

Its primary objectives are to ensure the long-term availability of timber supplies; to optimize timber uses; and to contribute to the growth and diversification of Alberta's economy.

The Agreement comprises three programs: Reforestation; Applied research, technology transfer and opportunity identification; and Public information, evaluation and administration. These programs are managed by a joint Directorate and are implemented by the Canadian Forestry Service and the Alberta Forest Service.

L'Entente Canada-Alberta sur la mise en valeur des ressources forestières est auxiliaire à l'Entente Canada-Alberta sur le développement économique et régional, qui vise à assurer la coordination et la coopération des deux gouvernements relativement au développement économique de l'Alberta.

L'Entente Canada-Alberta sur la mise en valeur des ressources forestières est financée à parts égales par les gouvernements du Canada et de l'Alberta, et a cours du 1er avril 1984 au 31 mars 1989.

Ses objectifs principaux sont assurer la disponibilité à long terme de réserves de bois; optimiser leur utilisation; et contribuer à la croissance et la diversification de l'économie de la province.

L'Entente comprend trois programmes: Reboisement; Recherche appliquée, transferts de connaissances techniques et relevé des occasions; et Information, évaluation et administration. Ces programmes sont gérés par un Bureau de direction conjoint, et mis en oeuvre par le Service canadien des forêts et le Service forestier de l'Alberta.

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ASPEN VS BLACK POPLAR DIFFERENCES
PHASE I - WAFERBOARD/OSB
FP 2.6.1

ALBERTA RESEARCH COUNCIL
INDUSTRIAL TECHNOLOGIES DEPARTMENT
FOREST PRODUCTS PROGRAM[1]

1987

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[1]Edmonton, Alberta

DISCLAIMER

The study on which this report is based was funded under the Canada-Alberta Forest Resource Development Agreement.

The views, conclusions, and recommendations are those of the authors. The exclusion of certain manufactured products does not necessarily imply disapproval nor does the mention of other products necessarily imply endorsement by the Canadian Forestry Service or the Alberta Forest Service.

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EXECUTIVE SUMMARY

1. Specimens

Aspen and black poplar trees were logged from the same site near Slave Lake and then waferized at Weldwood of Canada's OSB mill.

2. Analysis of Anatomical, Chemical and Physical Properties

The Department of Agricultural Engineering, University of Alberta, conducted this study. Black poplar has higher moisture content, wider vessels, coarser texture than aspen. The combination of low density and high moisture content variation in black poplar may be one of the major problems in controlling uniformity of wafer surfaces. (It is reported separately.)

3. Panels

Thirty panels were manufactured from aspen and black poplar. Experience indicates that it is technically feasible to manufacture panels from black poplar.

4. Panel Properties

At the 2.0% resin level, the properties of the panels made from these two materials are comparable.

5. Quality

Consistent product quality depends on consistent material going to the hot press. To maintain product quality when introducing significant volumes of black poplar, it may be necessary to set up a separate line and introduce dry wafers on a metered basis.

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1. OBJECTIVES AND GOALS

The following objectives and goals for the year ended March 31, 1987, are as set out in Proposal for Basic 1986/1987 Funding of the ARC Forest Products Program to the B.4 Canada-Alberta Forest Resource Development Agreement Committee, Document No. 86-PFP-8, March 10, 1986, and as agreed to by C-A FRDA.

Project #2.6: WOOD AND WOOD QUALITY

Objective of the Project:

To identify and quantify factors affecting quality.

Study #2.6.1: ASPEN VS BLACK POPLAR DIFFERENCES: PHASE 1 - WAFERBOARD/OSB

Objective of this Study:

To explore chemical differences betwen species and the effect on panel quality.

Goals for this Year:

By defining differences, it may be possible to alter manufacturing procedures to overcome these differences. Basic chemical and physical analysis of species. Panel manufacture. Comparison of products. Suggestions to modify properties.

2. INTRODUCTION

This report is submitted to the B.4 Committee, Canada-Alberta Forest Resource Development Agreement (C-A FRDA) by the Forest Products Program, Industrial Technologies Department, Alberta Research Council. It covers the activities for the year 1986/1987 under Study #2.6.1: Aspen vs Black Poplar Differences: Phase 1 - Waferboard/OSB.

Results from private mill trials, and from continued use in mills outside the province, indicate that Black Poplar can be used but that there are problems of extra costs associated with logging, waferizing, drying, and panel manufacture.

At present, Aspen is the only hardwood species used in the manufacture of OSB/waferboard in Alberta. The use of Black Poplar, which is a common species in Alberta and northern Canada, would reduce logging and raw material costs. The major drawback to the use of Black Poplar is its high moisture content which creates difficulties in strand preparation -- Black Poplar gums up the waferizing knives, and the Black Poplar chips are both harder to dry and harder to dry evenly.

Where Black Poplar has been used in mills for prolonged periods, there have been reports of difficulties in waferizing and of problems with quality. These are likely related. Difficulties in waferizing would

reduce strand quality -- in terms of greater strand surface roughness and increased fines production -- which, in turn, would reduce panel properties. This study did not evaluate manufacturing problems or reductions in panel properties owing to extended use of black poplar in the plants.

The aim of this study was to analyze differences and to compare the properties of panels made from the two species.

3. METHODS AND MATERIALS

3.1 Logging

Aspen and black poplar were logged near Weldwood of Canada Ltd.'s plant near Slave Lake, Alberta in September 1986. The logs were waferized by Weldwood and delivered for Forest Products Program for drying and panel manufacture. Figure 1 shows the logging site.

The area chosen to log the aspen and black poplar showed the stand to be 80 years old. Analysis by the University of Alberta indicated the trees were 110 to 120 years old.

3.2 Analysis of Anatomical, Chemical and Physical Differences

A contract was awarded to the Department of Agricultural Engineering, University of Alberta, to study the anatomical, chemical and physical differences of aspen and black poplar wood samples collected during logging.

The report by Dr. Michael M. Micko, Research Director/ Principal Investigator, is published separately.

3.3 Methods for Panel Manufacture

Thirty panels of aspen and black poplar at three resin levels were manufactured as per Table 1. Six groups with five panels per group were made.

All panels were manufactured on the 2' x 4' (610 mm x 1220 mm) press. Nominal thickness was 11.1 mm. Mats were hand-felted and random oriented, with wax at 1.2% of OD flake weight. Resin was phenol formaldehyde. Target density was 650 kg/m^3.

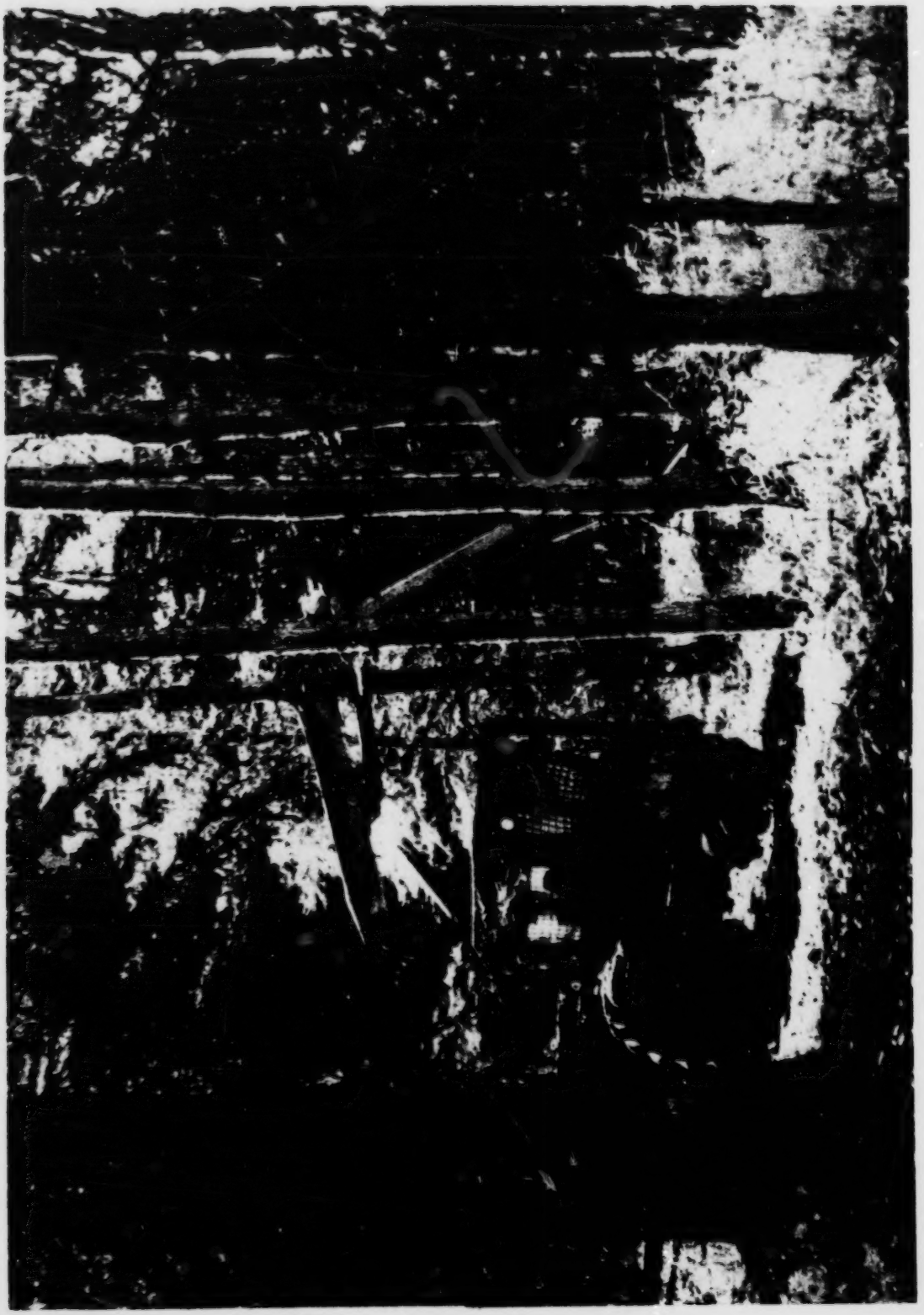


Figure 1: Logging Site

Table 1
EXPERIMENTAL DESIGN -
PANELS MANUFACTURED FOR STUDY OF
ASPEN AND BLACK POPLAR DIFFERENCES

Species	Resin Content		
	1.5%	2.0%	2.5%
Aspen	5 panels	5 panels	5 panels
Black Poplar	5 panels	5 panels	5 panels

3.3.1 Blending of Materials

Blending of the materials was done in a 2440 mm (8 ft) diameter, 1220 mm (4 ft) deep laboratory drum blender. The rotation of the blender was maintained at approximately 23 rev/min. to provide a cascade of the furnish. The blending cycle was as follows:

i) Melted wax was applied to the furnish through three atomizing spray nozzles at a rate of approximately 180 g/min. A sight glass on the wax pot was used to measure the quantity applied.

ii) A weighed quantity of powder resin was added to the furnish in the drum.

iii) The material was mixed for nine (9) minutes to allow the resin to spread evenly onto the furnish.

The material was mixed in batches of 45 kg green furnish weight.

3.3.2 Forming of the Mat

Each mat of furnish was formed by hand in a 770 x 1320 mm retaining box. The furnish was dispersed in small quantities in order to reduce stacking and bridging of the strands which alter the bulk density. The mat was continually weighed during the forming process to achieve consistent densities from panel to panel.

The mats were transported in and out of the press on top of a 685 x 1295 mm, 3.2 mm thick steel caul plate. An identical caul plate was placed over the formed mat prior to it being pressed.

3.3.3 Pressing of the Panels

The panels were pressed in a 712 x 1320 mm platen area laboratory hot press. The platens of this 500 ton capacity hydraulic press are heated electrically (maximum 70 kW of power available).

The platen temperature was set at 205 deg. C. Measurement of the coreline temperature was taken for a few panels to ensure that the core was attaining a high enough temperature for the resin to cure. The measurements were taken by a thermocouple positioned approximately at mid-thickness of the panel and 130 mm from the edges of one corner. Coreline temperature measurements were only recorded for low density panels, since the rate of temperature rise increases with increased pressure. A typical press cycle is shown in Figure 2.

All panels were pressed to metal stops positioned at the four corners of the platens. The stops equalized the panel thickness at the four corners of the panel, but did not significantly alter the total pressure on the panel. A press schedule (to pressure setpoint) was run from a programmable process controller for each press cycle in order to ensure that very little press load would be taken by the stops.

The press schedule consisted of the following four basic load stages:

a) Compression at a high maximum pressure.

b) Compression at an intermediate pressure to attain the target thickness.

c) Hold at low pressure to maintain constant thickness.

d) Decompression to nearly no press load to allow the steam to be slowly released from the core of the panel.

The pressure on the panel (assuming no load was taken by the stops) can be calculated by dividing the press load by the panel dimensional area:

$$\text{Panel Pressure [KPa]} = \frac{\text{Press Load [kN]}}{.685\ \text{m} * 1.250\ \text{m}} = 1.17 * \text{Press Load [kN]}$$

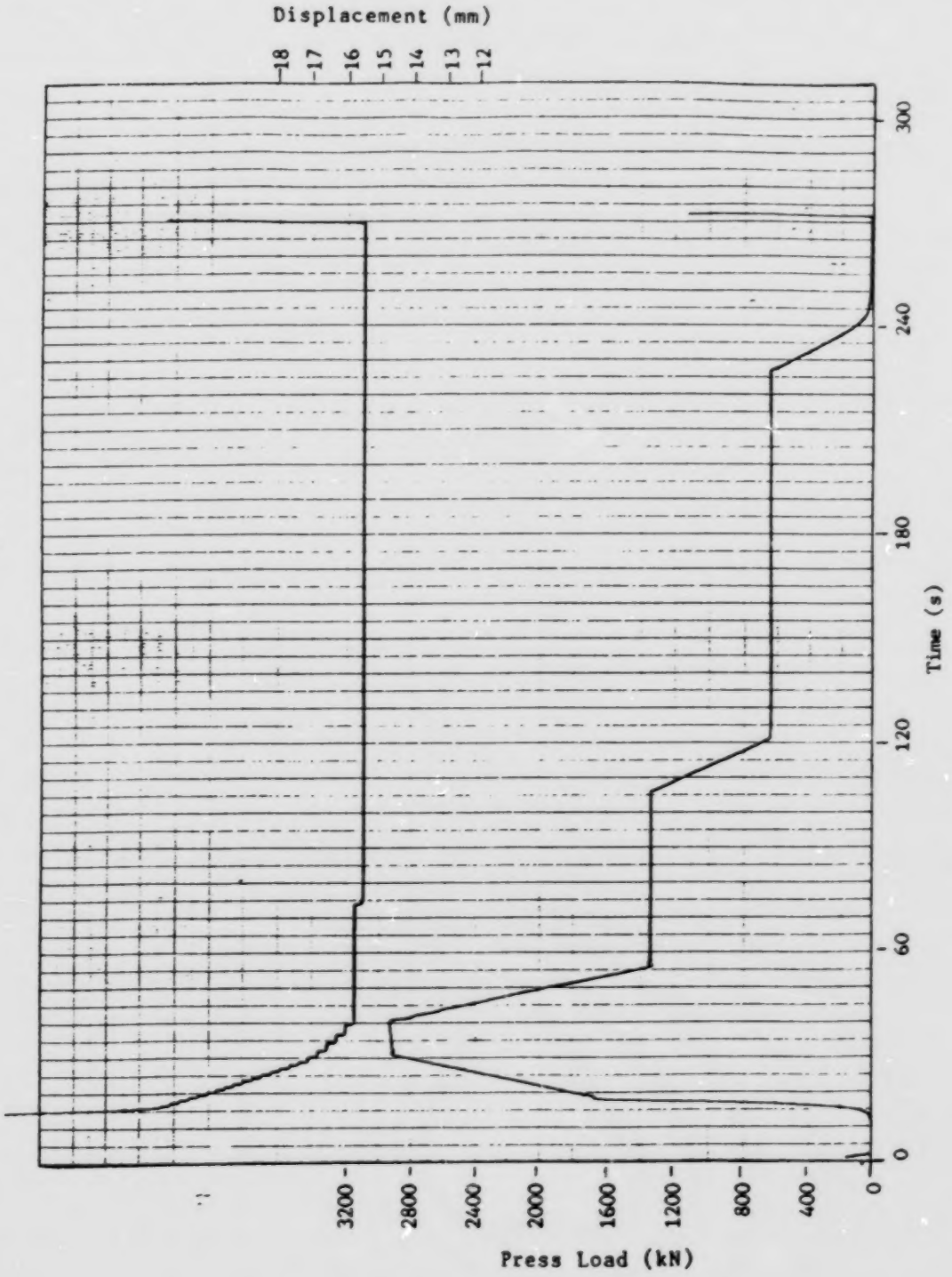


Figure 2: Typical Press Cycle

The plots of the press load also show the displacement between top and bottom platen measured by an LVDT positioned at one corner of the platens. This distance does not correspond to the actual panel thickness because of the zero offset caused by the thickness of the cauls and a small zero error. This measurement is, however, constant from panel to panel.

Panel thickness measurements with a micrometer and weight were taken after each panel was produced in order that the press cycle could be modified to attain the target thickness and density values.

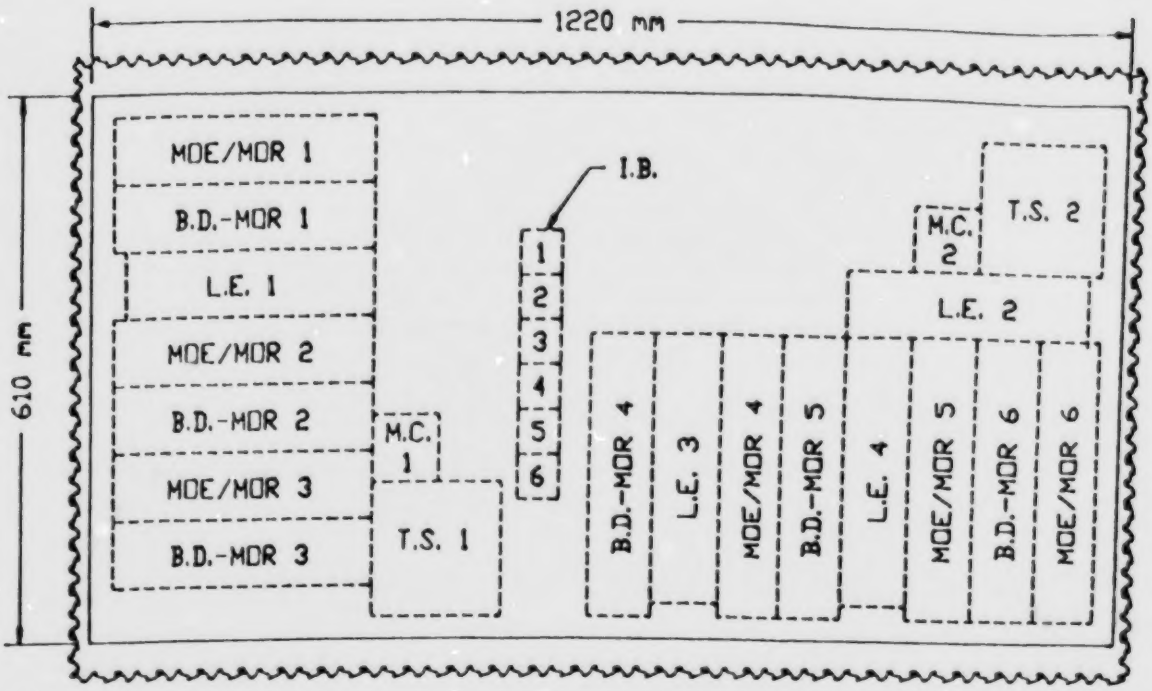
Enough panels were made to obtain at least five (5) "test" panels for each group. "Test" panels required that the density be within 10 kg/m^3 (0.6 lb/ft^3) of the target density and the average thickness be within 0.3 mm (0.012 in.) of the target thickness.

3.4 Methods for Panel Testing and Evaluation

Tests were conducted according to CAN3-0437.1-M, for most panel properties, and according to ASTM D1037 for moisture content and density.

Test methods are summarized in Figure 3.

Figure 3: Panel Cut-up Pattern for 610 x 1220 mm Panels



Legend	Number	Size	Test
MOE/MOR	6 (1,2,3 para. 4,5,6 perp.)	75 x 315 mm	Modulus of Elasticity and Modulus of Rupture
B.D.-MOR	6 (1,2,3 para. 4,5,6 perp.)	75 x 315 mm	Bond Durability-MOR after 2 h boil
L.E.	4 (1,2 para. 3,4 perp.)	75 x 300 mm	Linear Expansion-oven dry to saturated
I.B.	6	50 x 50 mm	Internal Bond
T.S.	2	150 x 150 mm	Thickness Swell-24 h soak
M.C.	2	75 x 75 mm	Moisture Content and Density

4. RESULTS AND DISCUSSION

4.1 Analysis of Anatomical, Chemical and Physical Differences

This report was completed by the Department of Agricultural Engineering, University of Alberta. Significant findings include the following:

* many Black Poplar trees have much higher moisture content in the heartwood zone than in the sapwood;
* Black Poplar has somewhat wider vessels than aspen, which contributes to the coarser texture and lower density of Black Poplar; and
* the combination of low density and high moisture content variation in Black Poplar may be one of the major problems in controlling uniformity of wafer surfaces.

4.2 Results and Discussion of Manufacture

Thirty panels were manufactured.

It was concluded that it is technically feasible to manufacture OSB/Waferboard from strands of Black Poplar. Manufacturing equipment used for aspen can also be used for Black Poplar.

In this study the species were run separately. Feasibility of mixing should be evaluated.

4.3 Test Results

Plots of Modulus of Rupture (MOR), Modulus of Elasticity (MOE), Bond Durability - MOR after 2 Hr. Boil, Internal Bond, Thickness Swell and Linear Expansion - Oven Dry to Saturated are shown in Figure 4 to 9 respectively. Tables of individual test results are shown in Appendix II for Aspen and in Appendix III for Black Poplar. A summary of test results is shown in Table 2. Except for Black Poplar at 1.5% resin content, all panel groups exceeded the CAN3-0437.0-M85 requirements for random panels (R-1). The thickness swell of Black Poplar panels at 1.5% resin content was 27%, whereas the maximum allowable in the standard is 25%.

The properties of the Black Poplar panels were comparable to the Aspen panels. Only internal bond and thickness swell properties of Black Poplar were significantly lower than those of Aspen. However, except for thickness swell of Black Poplar at 1.5% resin content, the internal bond and thickness swell of Black Poplar at the three resin levels exceeded CSA 0437 requirements.

Table 2

SUMMARY TABLE
GENERAL and GRADE PROPERTIES

Client: Alberta Research Council
Test Date: January 9 & 15, 1987
Project No.: 303261-13261

Test Material: Aspen & Black Poplar Waferb
Nom. Thickness: 11.1 mm
Conditioning: As Received

	Units	CAN3-0437 R-1 Req.	Samples Tested (N=)	Resin Content: Aspen 1.5%	Aspen 2.0%	Aspen 2.5%	Black Poplar 1.5%	Black Poplar 2.0%	Black Poplar 2.5%
Modulus of rupture	MPa	17.2	15	32.8	31.0	36.8	30.8	32.5	33.0
		17.2	15	31.6	35.0	39.7	32.9	32.2	33.3
			Avg	32.2	33.0	38.3	31.9	32.4	33.2
Modulus of elasticity	MPa	3100	15	5300	5100	5400	4800	4900	4900
		3100	15	5200	5500	5800	5100	5000	5000
			Avg	5300	5300	5600	5000	5000	5000
Internal bond	MPa	0.345	30	0.567	0.640	0.719	0.470	0.487	0.459
Bond durability - MOR after 2 h boil	MPa	8.6	15	16.3	17.1	19.2	18.2	18.8	16.9
		8.6	15	19.0	19.3	20.2	17.9	17.2	18.6
			Avg	17.7	18.2	19.7	18.1	18.0	17.8
Thickness swell - 24 h soak - 12.7 mm or thinner	%	25	10	21	16	19	29	21	21
Linear expansion - oven dry to saturated	%	0.40	10	0.21	0.23	0.21	0.24	0.19	0.24
		0.40	10	0.24	0.23	0.21	0.21	0.19	0.19
			Avg	0.23	0.23	0.21	0.23	0.19	0.22
Density	kg/m3	None	10	668	665	672	657	655	682
Moisture Content	%	Max. 8	10	3	3	3	2	2	3

FOREST PRODUCTS LABORATORY
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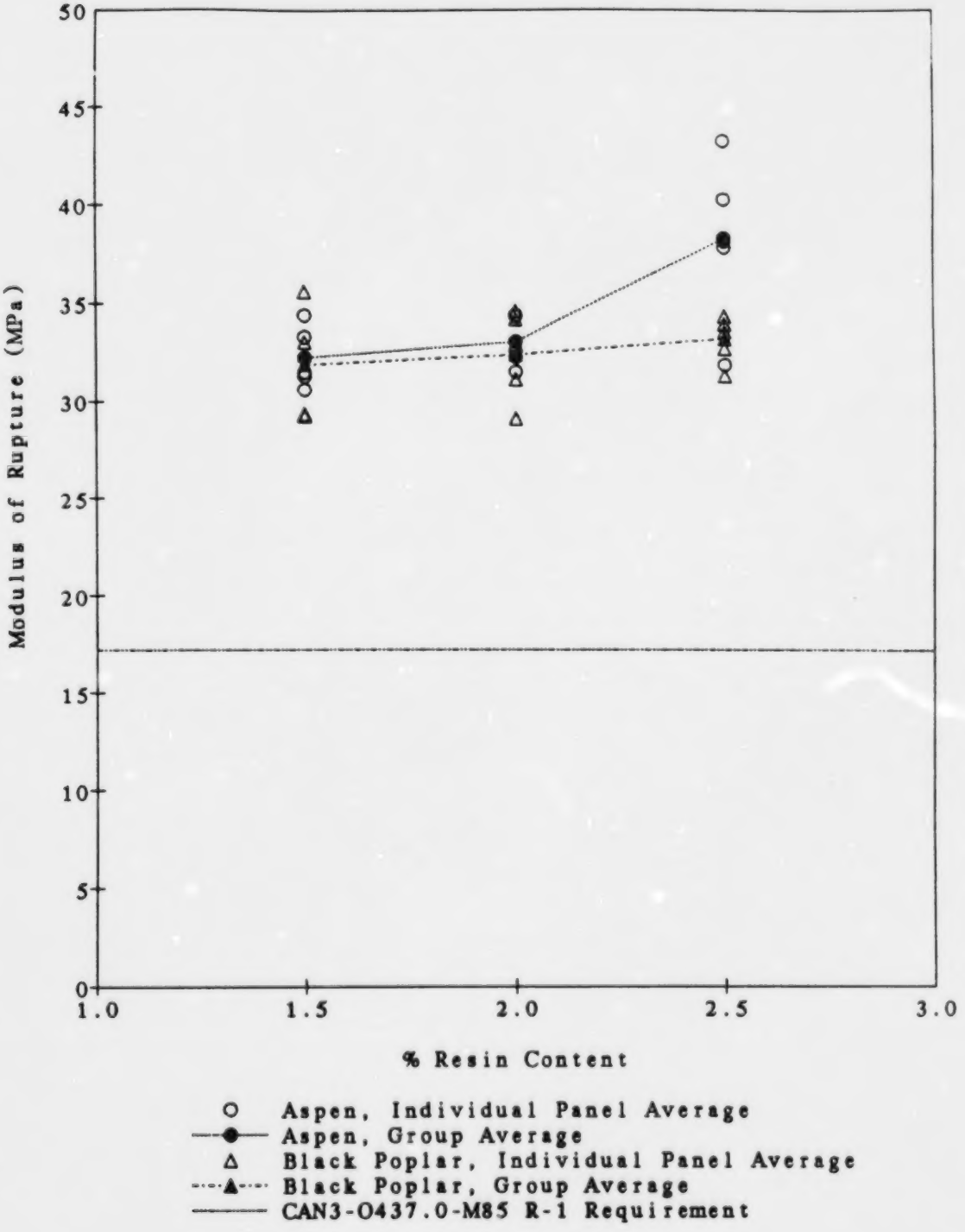

Figure 4: Dry MOR vs Resin Content
(Parallel and Perpendicular Test Combined)

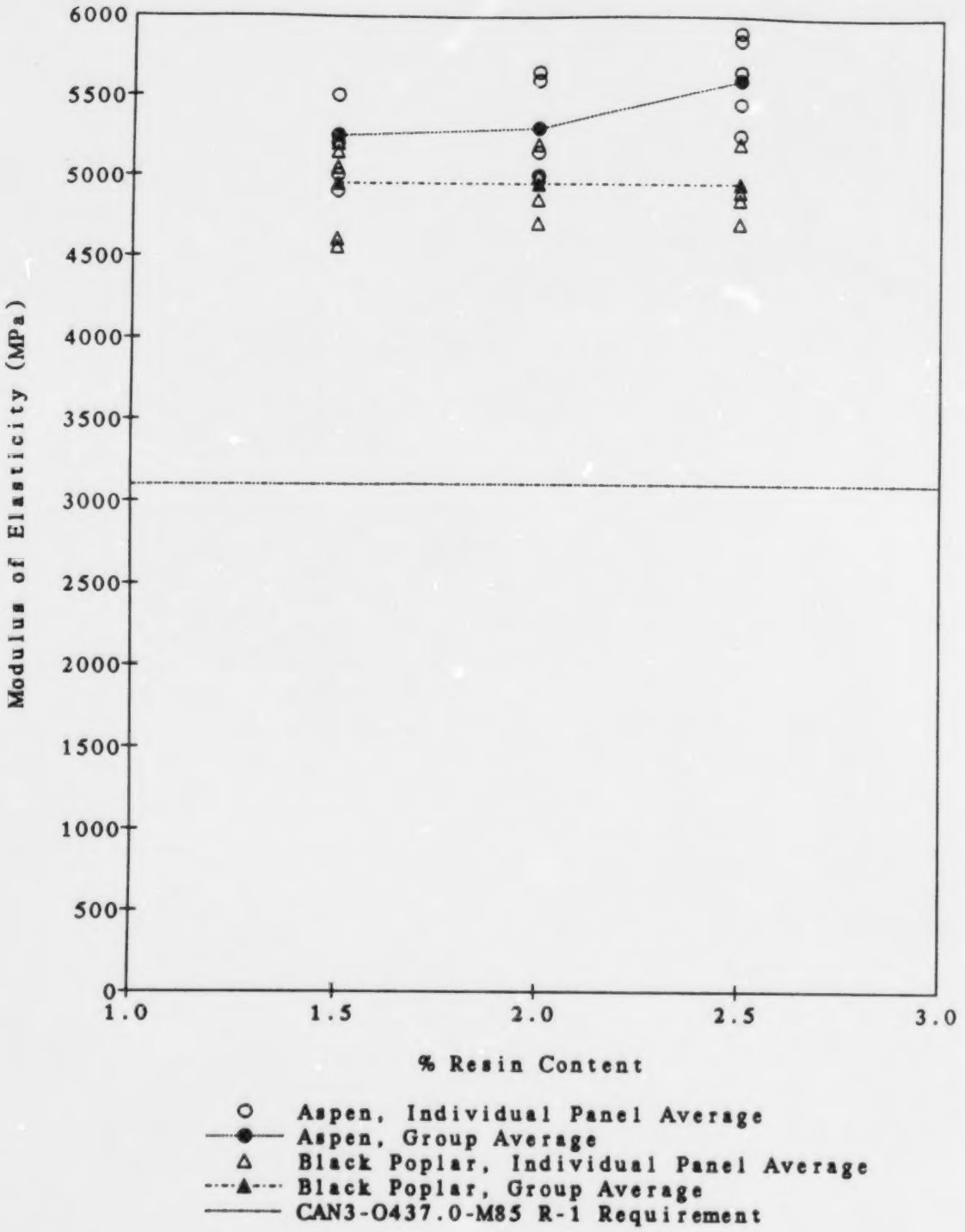

Figure 5: Dry MOE vs Resin Content
(Parallel and Perpendicular Tests Combined)

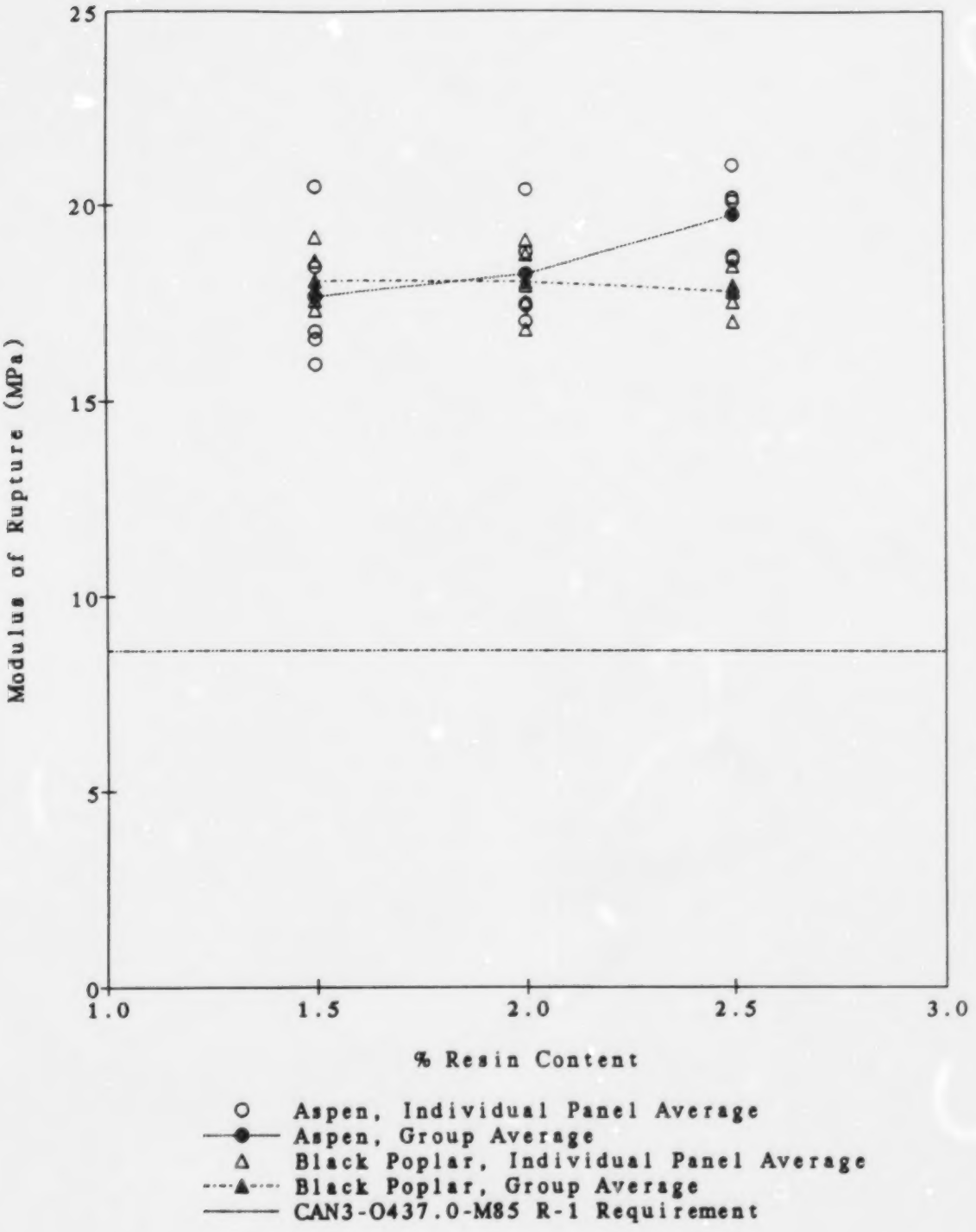

Figure 6: 2 Hour Boil MOR vs Resin Content
(Parallel and Perpendicular Tests Combined)

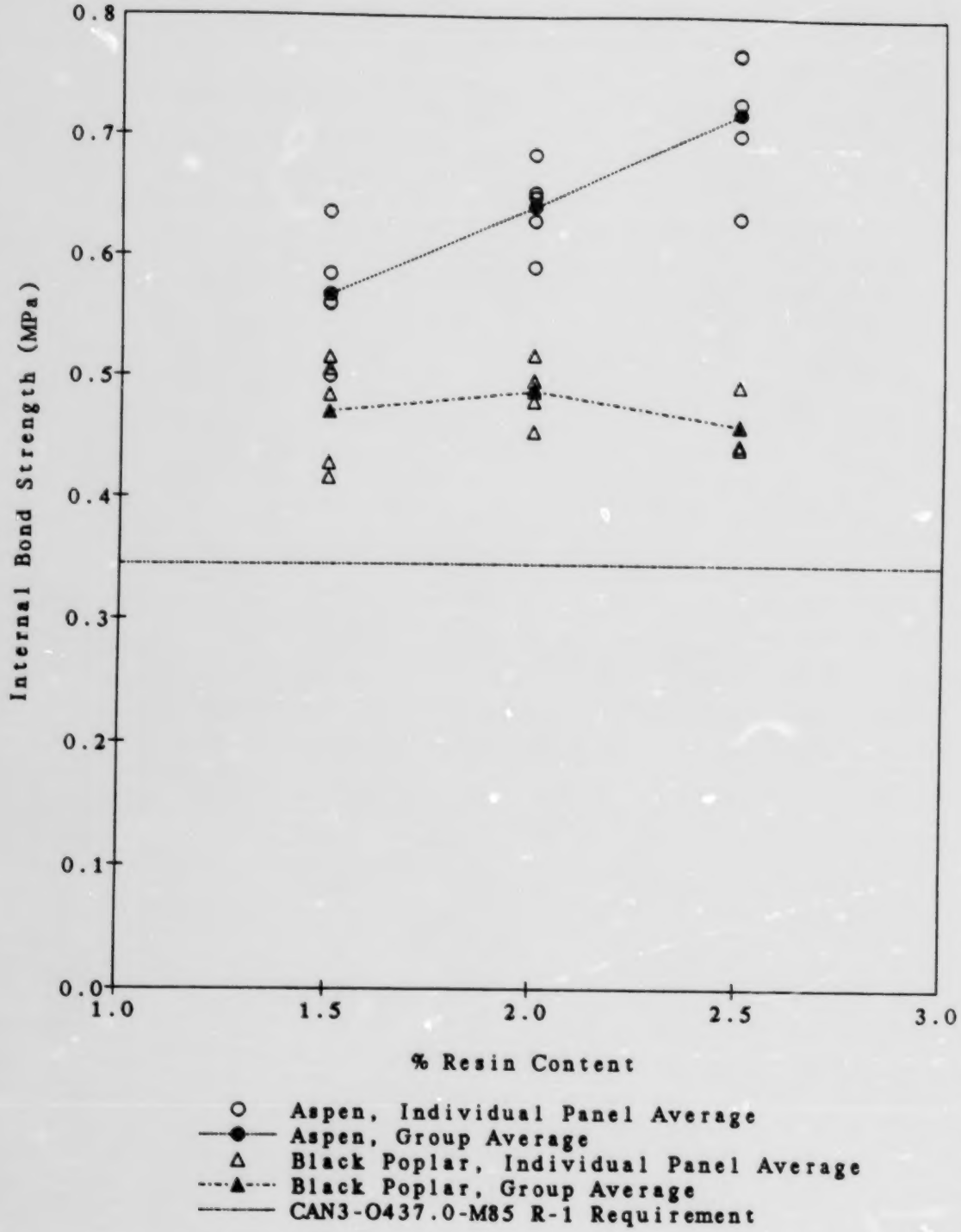

Figure 7: Internal Bond vs Resin Content

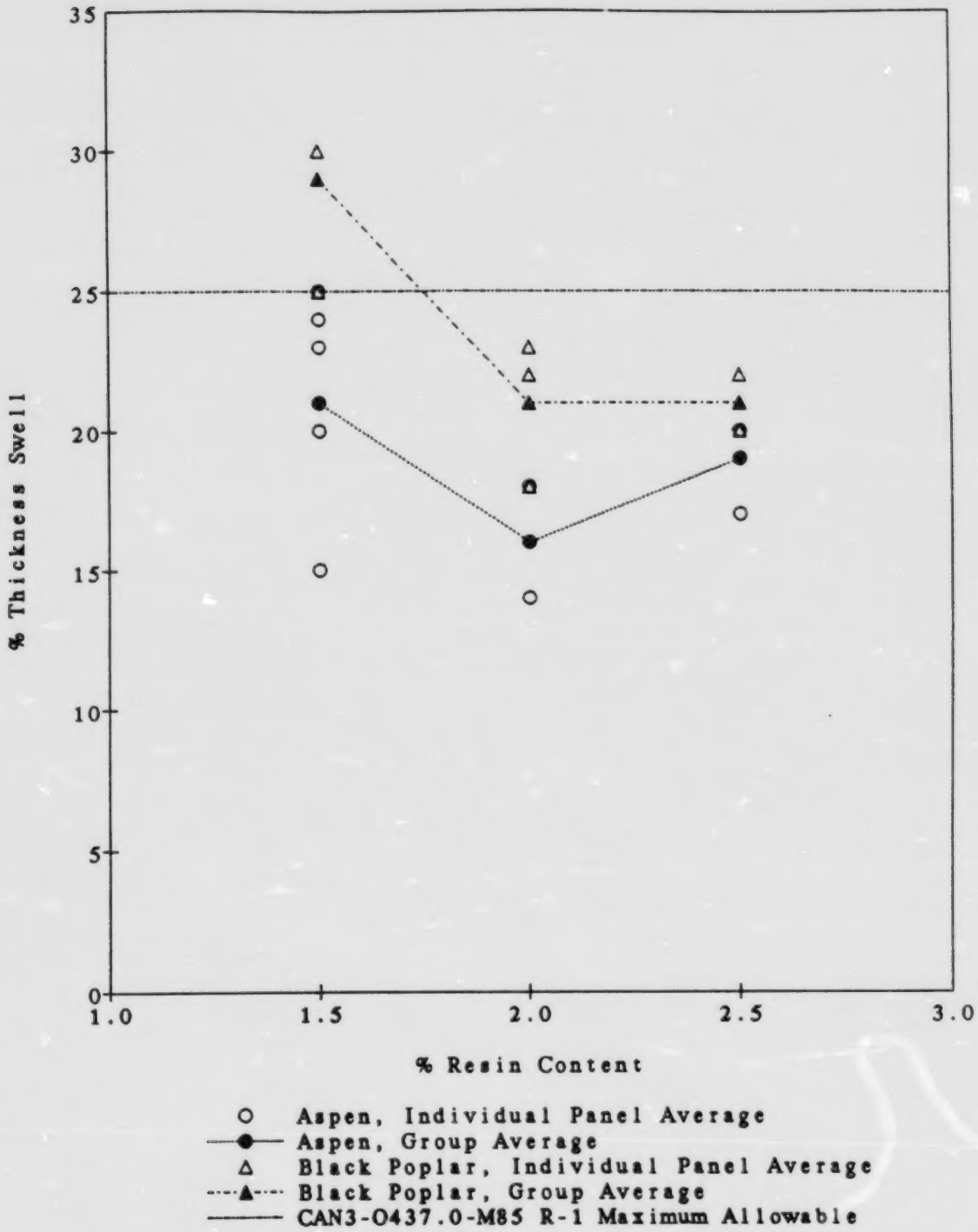

Figure 8: Thickness Swell vs Resin Content

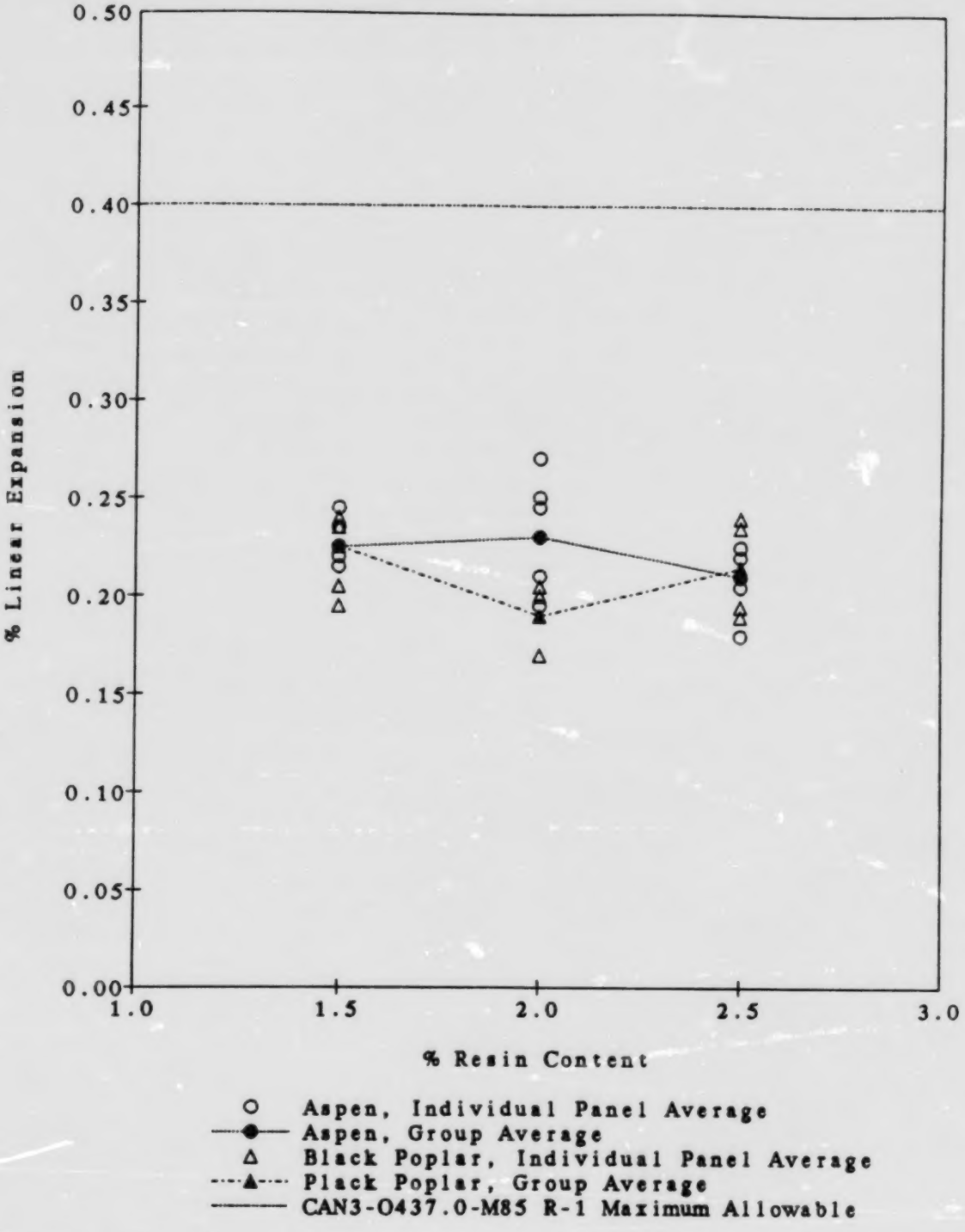

Figure 9: Linear Expansion vs Resin Content
(Parallel and Perpendicular Tests Combined)

5. CONCLUSIONS

1. High quality panels can be made using 100% Black Poplar.

2. Black Poplar increases manufacturing costs due to:

   - higher moisture content/lower density gives a higher delivered log cost per tonne of dry fiber
   - difficult to waferize - shorter knife life
   - higher drying cost
   - increased panel variability due to Aspen/Black Poplar ratio control.

Mixing Aspen and Black Poplar could cause serious product quality problems. Work funded by C-A FRDA has shown waferizing problems with Black Poplar, as well as drying problems. The Black Poplar wafers exit the dryer at a much higher moisture content. These differences indicate that a high quality product will depend on a constant ratio being maintained. With existing equipment this is only possible by separating the two species for waferizing and drying, then metering them together.

6. COMMERCIAL SIGNIFICANCE

Black Poplar forms a large portion of Alberta's hardwood resource. Solution of the technical problems associated with Black Poplar could increase hardwood utilization. Part of the operating cost increase could be offset by reduced hauling distances.

7. RECOMMENDATIONS

Further work should identify optimum waferizing conditions and use expected mixtures of Aspen and Black Poplar for panel manufacture as a mill trial. Further work should also include feasibility of modifications to existing mills for inclusion of Black Poplar lines.

8. ACKNOWLEDGEMENTS

The financial contribution to the Alberta Research Council's Forest Products Research and Development Program from the Alberta Forest Service (Alberta Forestry) and the Canadian Forestry Service (Agriculture Canada) is greatly appreciated.

9. REFERENCES

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APPENDICES

APPENDIX I

Reichhold Technical Bulletin for
IB-947 Phenolic Powdered Resin

REICHHOLD Technical Bulletin

Reichhold Limited
4 Robert Speck Parkway, Suite 700
Mississauga, Ontario L4Z 1S1
Telex: 06-960282

IB-947 PHENOLIC POWDERED RESIN FOR THE MANUFACTURE OF WAFERBOARD/OSB

IB-947 is a fast curing, one-step powdered phenolic resin especially developed for the waferboard/OSB industry. It is most often used as a core resin in conjunction with a surface resin such as IB-948 or BD-003 but may be used in single resin systems throughout the panel.

POWDER PROPERTIES:

Colour: Pink
Form of Compound: Very Fine Powder
Screen Test (R.L. Test Method): 85% through 200 mesh
Storage Life: 3-4 months at 20°C

GENERAL SPECIFICATIONS:

Hot Plate Cure at 150°C:	10-20 seconds
Softening Point (Capillary):	85-95°C

STORAGE AND SHIPPING:

Resin being of a hygroscopic nature, it is recommended to store in cool dry place - temperature not exceeding 20°C. Shipped in multi-wall paper bags or tote bags.

SPECIAL HANDLING PRECAUTIONS:

Avoid prolonged contact with the skin. The use of goggles and dust masks are recommended when handling powdered resins.

If powder comes in contact with the skin, it should be washed off with warm water and soap. Cleanliness is important.

SAFETY BULLETIN:

Bulletins are available on request.

JUNE 1985

The information herein is to assist customers in determining whether our products are suitable for their applications. We request that customers inspect and test our products before use and satisfy themselves as to contents and suitability. Nothing herein shall constitute a warranty, express or implied, including any warranty of merchantability or fitness, nor is protection from any law or patent inferred. All patent rights are reserved. The exclusive remedy for all proven claims is replacement of our materials.

APPENDIX II

Data Summary - Aspen

Table II-1

Thickness Tolerance
(CAN3-0437.1-M85)

Client: ARC
Test Date: Jan 9, 1987
Proj. Ref: 303261-13261

Test Material: A3 (1.5% Resin)
Nom. Thickness: 11.1 mm
Conditioning: As Received

Thickness Measurement		Panel No. A3-2 mm	A3-3 mm	A3-4 mm	A3-5 mm	A3-6 mm
Position 1		10.75	10.65	10.85	10.75	10.90
Position 2		11.10	10.95	10.95	11.05	11.15
Position 3		11.10	10.95	10.80	11.20	11.20
Position 4		10.85	10.85	10.75	11.05	11.20
Position 5		10.80	10.90	10.85	11.00	11.15
Position 6		10.60	10.70	10.75	10.60	10.90
Position 7		10.55	10.70	10.85	10.70	10.90
Position 8		10.70	10.70	10.95	10.80	10.90
Avg. Panel Thickness		10.80	10.80	10.85	10.90	11.05
Dev. of Average Panel Thickness from Nominal		-0.30	-0.30	-0.25	-0.20	-0.05
Range	High	11.10	10.95	10.95	11.20	11.20
	Low	10.55	10.65	10.75	10.60	10.90
Dev. Within Panel from Average	High	0.30	0.15	0.10	0.30	0.15
	Low	-0.25	-0.15	-0.10	-0.30	-0.15

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Table II-2

Moisture Content and Density
(CAN3-0437.1-M85)

Client: ARC
Test Date: Jan 10, 1987
Proj. Ref.: 303261-13261

Test Material: A3 (1.5% Resin)
Nom. Thickness: 11.1 mm
Conditioning: Oven Dry& at Test

Panel No.	Sample No.	Length	Width	Thick-ness	TEST Weight	O.D. Weight	M.C.	Avg. M.C.	Density at Test	Avg. Density at Test
		mm	mm	mm	g	g	%	%	kg/cu.m	kg/cu.m
	1	75.5	76.0	10.75	39.4	38.5	2		639	
A3-2	2	75.5	75.5	11.00	41.4	40.3	3	3	660	650
	1	75.5	76.0	10.80	41.2	40.4	2		665	
A3-3	2	76.0	75.5	10.95	42.0	41.0	2	2	668	667
	1	76.0	76.0	10.85	45.7	44.7	2		729	
A3-4	2	76.0	76.0	10.90	44.5	43.4	3	3	707	718
	1	76.0	76.0	10.80	40.5	39.7	2		649	
A3-5	2	76.0	76.0	11.10	40.5	39.5	3	3	632	640
	1	75.5	75.5	11.00	42.0	41.1	2		670	
A3-6	2	75.5	75.5	11.05	41.6	40.6	2	2	660	665
No.		10	10	10	10	10	11	5	10	5
Avg.		75.8	75.8	10.92	41.9	40.9	2	3	668	668

ALBERTA RESEARCH COUNCIL

FOREST PRODUCTS LABORATORY

Table II-3

MOR & MOE DRY-Parallel
(CAN3-0437.1-M85)

Client: ARC
Test Date: Jan 15, 1987
Proj.Ref.: 303261-13261
Test Material: A3 (1.5% Resin)
Nom. Thickness: 11.1 mm
Conditioning: As Received
Span: 265.0 mm

Panel No.	Sample No.	Thick-ness	Width	Max. Load	MOE	Avg. MOE	MOR	Avg. MOR
		mm	mm	N	MPa	MPa	MPa	MPa
	1	10.90	75.6	778	5100		34.4	
A3-2	2	10.74	75.8	606	5600	5400	27.6	32.3
	3	10.78	75.6	770	5500		34.8	
	1	10.72	75.8	790	5500		36.1	
A3-3	2	10.80	76.0	657	4500	5100	29.5	33.4
	3	10.86	76.0	785	5400		34.8	
	1	10.88	75.8	873	6500		38.7	
A3-4	2	10.98	75.8	905	6700	6000	39.4	36.8
	3	10.92	75.8	737	4900		32.4	
	1	10.76	75.8	711	4700		32.2	
A3-5	2	10.88	75.8	806	5400	5000	35.7	32.2
	3	10.80	75.8	641	4800		28.8	
	1	10.98	75.8	970	5300		42.2	
A3-6	2	11.06	75.8	435	3600	4900	18.6	29.3
	3	11.04	75.8	632	5800		27.2	
No.		15	15	15	15	5	15	5
Avg.		10.87	75.8	740	5300	5300	32.8	32.8

ALBERTA RESEARCH COUNCIL

FOREST PRODUCTS LABORATORY

Table II-4

MOR & MOE DRY-Perpendicular
(CAN3-0437.1-M85)

Client: ARC
Test Date: Jan 15, 1987
Proj.Ref.: 303261-13261

Test Material: A3 (1.5% Resin)
Nom. Thickness: 11.1 mm
Conditioning: As Received
Span: 265.0 mm

Panel No.	Sample No.	Thickness	Width	Max. Load	MOE	Avg. MOE	MOR	Avg. MOR
		mm	mm	N	MPa	MPa	MPa	MPa
	4	10.92	75.8	592	5300		26.0	
A3-2	5	11.04	75.6	725	5800	5600	31.3	30.6
	6	11.02	75.8	800	5600		34.5	
	4	10.92	75.8	887	4800		39.0	
A3-3	5	10.94	75.6	885	6700	5300	38.9	35.3
	6	10.86	75.6	631	4400		28.1	
	4	10.86	76.0	832	6100		36.9	
A3-4	5	10.84	75.8	589	4700	5000	26.3	29.7
	6	10.86	75.8	586	4300		26.1	
	4	10.96	75.6	674	3700		29.5	
A3-5	5	11.10	76.0	661	5300	4800	28.1	28.9
	6	11.16	75.6	691	5300		29.2	
	4	11.10	75.8	761	5200		32.4	
A3-6	5	11.12	75.8	629	4500	5100	26.7	33.2
	6	11.22	76.0	979	5600		40.7	
No.		15	15	15	15	5	15	5
Avg.		10.99	75.8	728	5200	5200	31.6	31.6

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FOREST PRODUCTS LABORATORY

Table II-5

Internal Bond
(CAN3-0437.1-M85)

Client: ARC
Test Date: Jan 14, 1987
Proj.Ref.: 303261-13261

Test Material: A3 (1.5% Resin)
Nom. Thickness: 11.1 mm
Conditioning: As Received

Panel No.	Sample Number	Sample Length	Sample Width	Maximum Load	Internal Bond Strength	Average For Panel
		mm	mm	N	MPa	MPa
A3-2	1	49.8	49.4	1444	0.587	0.584
	2	49.8	49.6	1378	0.558	
	3	50.0	49.4	1456	0.589	
	4	50.0	49.6	1493	0.602	
	5	50.0	49.4	1587	0.643	
	6	50.0	49.4	1295	0.524	
A3-3	1	49.8	49.2	1634	0.667	0.635
	2	49.8	42.2	1358	0.646	
	3	49.8	49.2	1224	0.500	
	4	49.8	49.4	1570	0.638	
	5	49.8	49.4	1856	0.754	
	6	49.8	49.2	1477	0.603	
A3-4	1	49.8	49.4	1186	0.482	0.560
	2	49.8	49.6	1601	0.648	
	3	49.2	49.8	1505	0.614	
	4	49.8	49.4	1018	0.414	
	5	49.8	49.4	1680	0.683	
	6	49.8	49.4	1280	0.520	
A3-5	1	50.0	49.2	1391	0.565	0.559
	2	49.8	49.2	1292	0.527	
	3	49.8	49.2	1140	0.465	
	4	49.8	49.4	1176	0.478	
	5	50.0	49.4	1585	0.642	
	6	49.8	49.4	1662	0.676	
A3-6	1	49.6	49.4	1199	0.489	0.499
	2	49.6	49.4	1244	0.508	
	3	49.6	49.4	1020	0.416	
	4	49.6	49.4	1461	0.596	
	5	49.6	49.4	1190	0.486	
	6	49.8	49.4	1234	0.502	
No.		30	30	30	30	5
Avg.		49.8	49.2	1390	0.567	0.567

Table II-6

Bond Durability-MOR after 2 Hour Boil-Parallel
(CAN3-0437.1-M85)

Client: ARC
Test Date: Jan 19, 1987
Proj.Ref.: 303261-13261
Span: 265 mm

Test Material: A3(1.5% Resin)
Nom. Thickness: 11.1 mm
Conditioning: 2 Hour Boil

Panel No.	Sample No.	Sample Thickness	Sample Width	Maximum Load	MOR	Average MOR for Panel
		mm	mm	N	MPa	MPa
	1	10.80	75.5	346	15.6	
A3-2	2	10.75	75.5	402	18.3	16.1
	3	10.70	75.5	313	14.4	
	1	10.80	76.0	462	20.7	
A3-3	2	10.80	76.0	382	17.1	19.1
	3	10.85	76.0	439	19.5	
	1	10.90	76.0	317	14.0	
A3-4	2	10.90	76.0	378	16.6	15.9
	3	10.80	76.0	381	17.1	
	1	10.75	76.0	356	16.1	
A3-5	2	10.80	76.0	284	12.7	14.4
	3	10.70	76.0	312	14.3	
	1	10.90	76.0	331	14.6	
A3-6	2	11.05	76.0	326	14.0	15.8
	3	11.05	76.0	443	19.0	
No.		15	15	15	15	5
Avg.		10.8	75.9	365	16.3	16.3

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Table II-7

Bond Durability-MOR after 2 Hour Boil-Perpendicular
(CAN3-0437.1-M85)

Client: ARC
Test Date: Jan 19, 1987
Proj.Ref.: 303261-13261
Span: 265 mm

Test Material: A3(1.5% Resin)
Nom. Thickness: 11.1 mm
Conditioning: 2 Hour Boil

Panel No.	Sample No.	Sample Thickness	Sample Width	Maximum Load	MOR	Average MOR for Panel
		mm	mm	N	MPa	MPa
	4	10.85	75.5	497	22.2	
A3-2	5	10.90	75.5	377	16.7	20.7
	6	10.85	76.0	524	23.3	
	4	10.90	75.5	575	25.5	
A3-3	5	10.90	76.0	528	23.2	21.8
	6	10.85	76.0	373	16.6	
	4	10.85	76.0	494	21.9	
A3-4	5	10.85	76.0	406	18.0	17.6
	6	10.80	76.0	287	12.9	
	4	10.90	75.5	426	18.9	
A3-5	5	10.95	75.5	411	18.0	17.4
	6	11.10	75.5	355	15.2	
	4	11.05	76.0	476	20.4	
A3-6	5	11.05	76.0	362	15.5	17.3
	6	11.10	76.0	375	15.9	
No.		15	15	15	15	5
Avg.		10.93	75.8	431	19.0	19.0

Table II-8

Thickness Swell
(CAN3-0437.1-M85)

Client: ARC
Test Date: Jan 15, 1987
Proj. Ref.: 303261-13261

Test Material: A3 (1.5% Resin)
Nom. Thickness: 11 mm
Conditioning: 24 hr. Soak

Panel No.	Sample No.	Dry Thickness Position 1	2	3	4	Wet Thickness Position 1	2	3	4	Average Thick. Swell
		mm	mm	mm	mm	mm	mm	mm	mm	%
A3-2	1	10.70	10.70	10.70	10.75	12.55	13.65	13.00	12.50	20
	2	11.20	11.15	11.05	11.10	12.55	13.60	13.20	13.60	
A3-3	1	10.90	10.80	10.85	10.90	13.45	13.00	13.10	13.10	24
	2	11.00	10.95	11.00	11.00	13.75	14.10	14.00	13.60	
A3-4	1	10.90	10.95	11.00	10.90	12.80	12.65	12.75	11.95	15
	2	10.90	10.85	10.95	10.90	12.35	12.50	12.80	12.65	
A3-5	1	10.75	10.80	10.85	10.70	12.85	13.20	13.65	13.00	25
	2	11.25	11.25	11.15	11.10	14.20	14.40	14.10	14.40	
A3-6	1	11.10	11.10	11.10	11.10	13.75	13.45	13.60	12.80	23
	2	11.30	11.25	11.20	11.20	14.75	13.85	13.95	14.10	
No.		10	10	10	10	10	10	10	10	5
Avg.		11.00	10.98	10.99	10.97	13.30	13.44	13.42	13.17	21

ALBERTA RESEARCH COUNCIL

FOREST PRODUCTS LABORATORY

Table II-9

Linear Expansion-Oven Dry to Saturated
(CAN3-0437.1-M85)

Client: ARC
Test Date: Jan. 16, 1987
Proj. Ref.: 303261-13261

Test Material: A3 (1.5% Resin)
Nom. Thickness: 11.1 mm
Conditioning: OD to Saturated

Panel No.	Sample No.		Oven Dry Gauge Length		Vac.-Pressure Gauge Length		Linear Expansion		Avg. Linear Expansion	
	Par.	Perp.	Par.	Perp.	Par.	Perp.	Par.	Perp.	Par.	Perp.
			mm	mm	mm	mm	%	%	%	%
A3-2	1	3	249.55	251.05	250.10	251.70	0.22	0.26	0.20	0.23
	2	4	249.30	249.20	249.75	249.70	0.18	0.20		
A3-3	1	3	249.75	248.75	250.40	249.35	0.26	0.24	0.23	0.24
	2	4	249.90	248.00	250.40	248.60	0.20	0.24		
A3-4	1	3	249.20	248.65	249.75	249.25	0.22	0.24	0.20	0.24
	2	4	249.65	251.40	250.10	252.00	0.18	0.24		
A3-5	1	3	250.70	248.65	251.10	249.30	0.16	0.26	0.20	0.25
	2	4	249.35	248.30	249.95	248.90	0.24	0.24		
A3-6	1	3	249.75	251.00	250.30	251.70	0.22	0.28	0.24	0.25
	2	4	250.80	249.40	251.45	249.95	0.26	0.22		
No.			10	10	10	10	10	10	5	5
Avg.			249.80	249.45	250.35	250.05	0.21	0.24	0.21	0.24

ALBERTA RESEARCH COUNCIL

FOREST PRODUCTS LABORATORY

Table II-10

Thickness Tolerance
(CAN3-O-37.1-M85)

Client: ARC
Test Date: Jan. 9, 1987
Proj. Ref: 303261-13261

Test Material: A2 (2.0% Resin)
Nom.Thickness: 11.1 mm
Conditioning: As Received

Thickness Measurement		Panel No. A2-3 mm	A2-4 mm	A2-7 mm	A2-8 mm	A2-9 mm
Position 1		10.80	10.90	10.85	10.85	10.90
Position 2		11.25	11.30	11.30	10.75	10.95
Position 3		11.35	11.25	11.40	10.70	11.15
Position 4		11.45	11.20	11.25	10.60	11.05
Position 5		11.40	11.10	11.15	10.60	11.05
Position 6		10.80	10.85	10.75	10.70	11.00
Position 7		10.65	10.75	10.80	10.85	11.05
Position 8		10.60	10.85	10.80	10.90	11.05
Avg. Panel Thickness		11.05	11.05	11.05	10.75	11.05
Dev. of Average Panel Thickness from Nominal		-0.05	-0.05	-0.05	-0.35	-0.05
Range	High	11.45	11.30	11.40	10.90	11.15
	Low	10.60	10.75	10.75	10.60	10.90
Dev. Within Panel from Average	High	0.40	0.25	0.35	0.15	0.10
	Low	-0.45	-0.30	-0.30	-0.15	-0.15

ALBERTA RESEARCH COUNCIL

FOREST PRODUCTS LABORATORY

Table II-11

Moisture Content and Density
(CAN3-0437.1-M85)

Client: ARC
Test Date: Jan 10, 1987
Proj. Ref.: 303261-13261

Test Material: A2(2.0% Resin)
Nom. Thickness: 11.1 mm
Conditioning: Oven Dry& at Test

Panel No.	Sample No.	Length	Width	Thick-ness	TEST Weight	O.D. Weight	M.C.	Avg. M.C.	Density at Test	Avg. Density at Test
		mm	mm	mm	g	g	%	%	kg/cu.m	kg/cu.m
	1	76.0	76.0	11.05	44.6	43.5	3		699	
A2-3	2	76.0	75.5	11.30	44.6	43.4	3	3	688	693
	1	76.0	76.0	10.85	39.0	38.0	3		622	
A2-4	2	76.0	75.0	11.30	44.6	43.6	2	3	692	657
	1	76.0	75.5	11.05	43.0	41.8	3		678	
A2-7	2	75.5	75.5	11.25	42.7	41.4	3	3	666	672
	1	75.5	75.5	10.80	40.8	39.8	3		663	
A2-8	2	76.0	76.0	10.80	42.6	41.6	2	3	683	673
	1	75.5	75.5	10.80	35.9	34.9	3		583	
A2-9	2	75.5	75.5	10.95	42.1	41.1	2	3	674	629
No.		10	10	10	10	10	11	5	10	5
Avg.		75.8	75.6	11.02	42.0	40.9	2	3	665	665

ALBERTA RESEARCH COUNCIL

FOREST PRODUCTS LABORATORY

Table II-12

MOR & MOE DRY-Parallel
(CAN3-0437.1-M85)

Client: ARC
Test Date: Jan 15, 1987
Proj.Ref.: 303261-13261

Test Material: A2 (2.0% Resin)
Nom. Thickness: 11.1 mm
Conditioning: As Received
Span: 265.0 mm

Panel No.	Sample No.	Thick-ness	Width	Max. Load	MOE	Avg. MOE	MOR	Avg. MOR
		mm	mm	N	MPa	MPa	MPa	MPa
	1	10.76	75.8	857	5700		38.8	
A2-3	2	10.94	75.8	916	5600	5100	40.1	32.8
	3	10.84	75.8	437	4000		19.5	
	1	10.90	75.8	724	6200		32.0	
A2-4	2	10.90	75.8	695	4600	5300	30.7	30.6
	3	10.88	75.8	660	5000		29.2	
	1	10.98	75.8	798	4900		34.7	
A2-7	2	10.92	75.8	616	5100	5000	27.1	30.1
	3	10.88	75.8	640	5100		28.4	
	1	10.88	75.8	597	4600		26.4	
A2-8	2	10.98	75.8	676	5700	5200	29.4	30.7
	3	10.96	75.8	831	5400		36.3	
	1	11.02	75.6	648	5000		28.1	
A2-9	2	11.08	75.8	729	4800	4900	31.1	30.6
	3	11.00	75.6	752	4900		32.7	
No.		15	15	15	15	5	15	5
Avg.		10.93	75.8	705	5100	5100	31.0	31.0

ALBERTA RESEARCH COUNCIL

FOREST PRODUCTS LABORATORY

Table II-13

MOR & MOE DRY-Perpendicular
(CAN3-0437.1-M85)

Client: ARC
Test Date: Jan 15, 1987
Proj.Ref.: 303261-13261

Test Material: A2 (2.0% Resin)
Nom. Thickness: 11.1 mm
Conditioning: As Received
Span: 265.0 mm

Panel No.	Sample No.	Thick-ness	Width	Max. Load	MOE	Avg. MOE	MOR	Avg. MOR
		mm	mm	N	MPa	MPa	MPa	MPa
	4	11.24	75.8	668	4300		27.7	
A2-3	5	11.38	76.0	814	4800	4900	32.9	31.6
	6	11.48	75.6	857	5700		34.2	
	4	11.04	75.8	825	5100		35.5	
A2-4	5	11.16	75.8	968	5800	5900	40.8	38.1
	6	11.28	75.8	922	6700		38.0	
	4	11.18	75.8	801	5200		33.6	
A2-7	5	11.26	75.8	937	5000	5000	38.8	35.0
	6	11.30	75.8	798	4900		32.8	
	4	10.82	76.0	573	5200		25.6	
A2-8	5	10.70	75.8	1001	6500	6100	45.8	37.9
	6	10.88	75.8	957	6500		42.4	
	4	11.00	75.8	688	5500		29.8	
A2-9	5	10.98	75.8	825	6100	5400	35.9	32.3
	6	11.12	75.8	738	4700		31.3	
No.		15	15	15	15	5	15	5
Avg.		11.12	75.8	825	5500	5500	35.0	35.0

ALBERTA RESEARCH COUNCIL

FOREST PRODUCTS LABORATORY

Table II-14

Internal Bond
(CAN3-0437.1-M85)

Client: ARC
Test Date: Jan 14, 1987
Proj.Ref.: 303261-13261

Test Material: A2 (2% Resin)
Nom. Thickness: 11.1 mm
Conditioning: As Received

Panel No.	Sample Number	Sample Length	Sample Width	Maximum Load	Internal Bond Strength	Average For Panel
		mm	mm	N	MPa	MPa
A2-3	1	49.8	49.4	1391	0.565	0.590
	2	49.8	49.4	1189	0.483	
	3	49.8	49.4	1528	0.621	
	4	49.8	49.4	1476	0.600	
	5	49.8	49.6	1643	0.665	
	6	49.8	49.6	1489	0.603	
A2-4	1	49.8	49.4	1774	0.721	0.648
	2	49.8	49.0	1681	0.689	
	3	50.0	49.4	1634	0.662	
	4	50.0	49.4	1263	0.511	
	5	50.0	49.4	1362	0.551	
	6	50.0	49.4	1866	0.755	
A2-7	1	49.8	49.6	1367	0.553	0.628
	2	49.8	49.6	1938	0.785	
	3	49.8	49.6	1787	0.723	
	4	49.8	49.6	1648	0.667	
	5	49.8	49.6	1480	0.599	
	6	49.8	49.2	1080	0.441	
A2-8	1	49.8	49.4	1514	0.615	0.652
	2	49.8	49.2	1734	0.708	
	3	49.8	49.4	1857	0.755	
	4	49.8	49.2	1585	0.647	
	5	49.8	49.4	1315	0.535	
	6	49.8	49.2	1603	0.654	
A2-9	1	49.6	49.4	1767	0.721	0.684
	2	49.6	49.6	1885	0.766	
	3	49.8	49.4	1387	0.564	
	4	49.4	49.4	1632	0.669	
	5	49.6	49.4	1656	0.676	
	6	49.8	49.4	1744	0.709	
No.		30	30	30	30	5
Avg.		49.8	49.4	1580	0.640	0.640

ALBERTA RESEARCH COUNCIL

FOREST PRODUCTS LABORATORY

Table II-15

Bond Durability-MOR after 2 Hour Boil-Parallel
(CAN3-0437.1-M85)

Client: ARC
Test Date: Jan 19, 1987
Proj.Ref.: 303261-13261
Span: 265 mm

Test Material: A2(2.0% Resin)
Nom. Thickness: 11.1 mm
Conditioning: 2 Hour Boil

Panel No.	Sample No.	Sample Thickness	Sample Width	Maximum Load	MOR	Average MOR for Panel
		mm	mm	N	MPa	MPa
	1	10.70	75.5	420	19.3	
A2-3	2	10.90	75.5	368	16.3	16.8
	3	10.75	75.5	326	14.9	
	1	10.95	75.5	413	18.1	
A2-4	2	10.75	75.5	299	13.6	17.3
	3	10.85	76.0	455	20.2	
	1	10.95	76.0	473	20.6	
A2-7	2	10.90	75.5	380	16.8	16.7
	3	10.80	76.0	279	12.5	
	1	10.90	75.5	450	19.9	
A2-8	2	10.95	75.5	423	18.6	18.5
	3	10.80	75.5	374	16.9	
	1	11.00	76.0	480	20.7	
A2-9	2	11.00	75.5	271	11.8	16.1
	3	11.00	75.5	365	15.9	
No.		15	15	15	15	5
Avg.		10.9	75.6	385	17.1	17.1

ALBERTA RESEARCH COUNCIL

FOREST PRODUCTS LABORATORY

Table II-16

Bond Durability-MOR after 2 Hour Boil-Perpendicular
(CAN3-0437.1-M85)

Client: ARC
Test Date: Jan 19. 1987
Proj.Ref.: 303261-13261
Span: 265 mm

Test Material: A2(2.0% Resin)
Nom. Thickness: 11.1 mm
Conditioning: 2 Hour Boil

Panel No.	Sample No.	Sample Thickness	Sample Width	Maximum Load	MOR	Average MOR for Panel
		mm	mm	N	MPa	MPa
	4	11.15	76.0	553	23.3	
A2-3	5	11.30	76.0	491	20.1	18.1
	6	11.30	76.0	266	10.9	
	4	10.90	75.5	329	14.6	
A2-4	5	11.05	75.5	440	19.0	16.7
	6	11.20	75.5	395	16.6	
	4	11.10	76.0	696	29.5	
A2-7	5	11.20	76.0	468	19.5	20.8
	6	11.25	75.5	322	13.4	
	4	10.80	76.0	430	19.3	
A2-8	5	10.75	76.0	560	25.3	22.2
	6	10.65	76.0	476	21.9	
	4	10.95	75.5	456	20.0	
A2-9	5	11.00	75.5	450	19.6	18.7
	6	11.05	75.5	386	16.6	
No.		15	15	15	15	5
Avg.		11.04	75.8	448	19.3	19.3

ALBERTA RESEARCH COUNCIL

FOREST PRODUCTS LABORATORY

Table II-17

Thickness Swell
(CAN3-0437.1-M85)

Client: ARC
Test Date: Jan. 12, 1987
Proj. Ref.: 303261-13261

Test Material: A2 (2.0% Resin)
Nom. Thickness: 11.1 mm
Conditioning: 24 hr. Soak

Panel No.	Sample No.	Dry Thickness Position 1	Dry Thickness Position 2	Dry Thickness Position 3	Dry Thickness Position 4	Wet Thickness Position 1	Wet Thickness Position 2	Wet Thickness Position 3	Wet Thickness Position 4	Average Thick. Swell
		mm	mm	mm	mm	mm	mm	mm	mm	%
A2-3	1	10.90	10.95	10.95	10.90	13.80	13.20	12.80	12.75	18
	2	11.40	11.35	11.30	11.35	12.90	13.65	13.05	13.20	
A2-4	1	10.85	10.90	10.90	10.85	13.00	12.50	12.60	12.95	16
	2	11.30	11.30	11.30	11.40	13.25	13.10	12.80	13.10	
A2-7	1	11.05	11.05	11.05	11.00	12.45	12.50	12.45	12.65	16
	2	11.45	11.40	11.40	11.45	13.30	12.45	14.40	14.20	
A2-8	1	10.90	10.90	10.85	10.80	12.05	11.95	12.15	12.60	16
	2	10.85	10.80	10.75	10.80	13.55	12.65	12.60	12.60	
A2-9	1	10.95	11.00	11.00	11.05	12.45	12.15	12.70	11.80	14
	2	11.25	11.10	11.05	11.15	13.20	12.70	12.75	13.25	
No.		10	10	10	10	10	10	10	10	5
Avg.		11.09	11.08	11.06	11.08	13.00	12.69	12.83	12.91	16

ALBERTA RESEARCH COUNCIL

FOREST PRODUCTS LABORATORY

Table II-18

Linear Expansion-Oven Dry to Saturated
(CAN3-0437.1-M85)

Client: ARC
Test Date: Jan 16, 1987
Proj. Ref.: 303261-13261

Test Material: A2 (2% Resin)
Nom. Thickness: 11.1 mm
Conditioning: OD to Saturated

Panel No.	Sample No.		Oven Dry Gauge Length		Vac.-Pressure Gauge Length		Linear Expansion		Avg. Linear Expansion	
	Par.	Perp.	Par.	Perp.	Par.	Perp.	Par.	Perp.	Par.	Perp.
			mm	mm	mm	mm	%	%	%	%
A2-3	1	3	249.70	249.50	250.30	250.20	0.24	0.28	0.29	0.25
	2	4	250.35	249.65	251.20	250.20	0.34	0.22		
A2-4	1	3	250.45	248.75	251.00	249.45	0.22	0.28	0.24	0.25
	2	4	249.50	250.20	250.15	250.75	0.26	0.22		
A2-7	1	3	250.35	249.45	250.75	249.95	0.16	0.20	0.20	0.19
	2	4	249.05	250.25	249.65	250.70	0.24	0.18		
A2-8	1	3	250.20	249.35	250.65	249.80	0.18	0.18	0.20	0.22
	2	4	248.95	249.45	249.50	250.10	0.22	0.26		
A2-9	1	3	250.20	250.35	250.80	250.95	0.24	0.24	0.24	0.26
	2	4	248.90	249.00	249.50	249.70	0.24	0.28		
No.			10	10	10	10	10	10	5	5
Avg.			249.75	249.60	250.35	250.20	0.23	0.23	0.23	0.23

ALBERTA RESEARCH COUNCIL

FOREST PRODUCTS LABORATORY

Table II-19

Thickness Tolerance
(CAN3-0437.1-M85)

Client: ARC
Test Date: Jan. 9, 1987
Proj. Ref: 303261-13261

Test Material: A1 (2.5% Resin)
Nom.Thickness: 11.1 mm
Conditioning: As Received

Thickness Measurement		Panel No. A1-3 mm	A1-4 mm	A1-5 mm	A1-8 mm	A1-9 mm
Position 1		10.40	11.05	10.70	11.75	10.30
Position 2		10.90	11.55	10.35	11.35	11.00
Position 3		11.10	11.50	10.25	11.10	11.05
Position 4		11.35	11.00	10.70	10.45	11.15
Position 5		11.50	10.70	11.05	10.55	11.30
Position 6		11.20	10.50	11.50	10.95	10.85
Position 7		10.95	10.50	11.50	11.05	10.70
Position 8		10.40	10.85	10.95	11.45	10.50
Avg. Panel Thickness		11.00	10.95	10.90	11.10	10.85
Dev. of Average Panel Thickness from Nominal		-0.10	-0.15	-0.20	0.00	-0.25
Range	High	11.50	11.55	11.50	11.75	11.30
	Low	10.40	10.50	10.25	10.45	10.30
Dev. Within Panel from Average	High	0.50	0.60	0.60	0.65	0.45
	Low	-0.60	-0.45	-0.65	-0.65	-0.55

ALBERTA RESEARCH COUNCIL

FOREST PRODUCTS LABORATORY

Table II-20

Moisture Content and Density
(CAN3-0437.1-M85)

Client: ARC
Test Date: Jan 10, 1987
Proj. Ref.: 303261-13261

Test Material: A1(2.5% Resin)
Nom. Thickness: 11.1 mm
Conditioning: Oven Dry& at Test

Panel No.	Sample No.	Length	Width	Thick-ness	TEST Weight	O.D. Weight	M.C.	Avg. M.C.	Density at Test	Avg. Density at Test
		mm	mm	mm	g	g	%	%	kg/cu.m	kg/cu.m
	1	76.0	76.0	10.75	43.1	41.7	3		694	
A1-3	2	75.5	76.0	11.05	42.8	41.0	4	4	675	685
	1	76.0	76.0	10.55	38.9	37.7	3		638	
A1-4	2	75.5	76.0	11.05	43.6	42.2	3	3	688	663
	1	76.0	76.0	10.65	39.2	38.1	3		637	
A1-5	2	75.5	76.0	10.55	41.6	40.4	3	3	687	662
	1	76.0	76.0	10.85	39.9	39.0	2		637	
A1-8	2	76.0	76.0	10.90	42.6	41.7	2	2	677	657
	1	76.0	76.0	10.55	44.9	44.0	2		737	
A1-9	2	76.0	76.0	11.05	41.6	40.3	3	3	652	694
No.		10	10	10	10	10	11	5	10	5
Avg.		75.9	76.0	10.80	41.8	40.6	3	3	672	672

ALBERTA RESEARCH COUNCIL

FOREST PRODUCTS LABORATORY

Table II-21

MOR & MOE DRY-Parallel
(CAN3-0437.1-M85)

Client: ARC
Test Date: Jan 15, 1987
Proj.Ref.: 303261-13261

Test Material: A1 (2.5% Resin)
Nom. Thickness: 11.1 mm
Conditioning: As Received
Span: 265.0 mm

Panel No.	Sample No.	Thick-ness	Width	Max. Load	MOE	Avg. MOE	MOR	Avg. MOR
		mm	mm	N	MPa	MPa	MPa	MPa
	1	10.46	75.6	748	6100		35.9	
A1-3	2	10.58	76.0	1124	6100	5800	52.5	41.5
	3	10.72	75.6	790	5100		36.1	
	1	11.12	75.8	762	4700		32.3	
A1-4	2	10.54	75.8	802	5400	5200	37.9	35.8
	3	10.50	75.8	783	5500		37.2	
	1	10.84	75.8	904	5500		40.3	
A1-5	2	10.92	76.0	928	5700	5600	40.7	39.3
	3	11.08	76.0	862	5500		36.7	
	1	11.66	75.8	1003	6200		38.7	
A1-8	2	11.06	75.6	711	5600	5400	30.6	32.2
	3	10.90	75.6	620	4300		27.4	
	1	10.46	75.8	870	6000		41.7	
A1-9	2	10.34	75.6	643	4900	5200	31.6	35.2
	3	10.48	75.8	676	4800		32.3	
No.		15	15	15	15	5	15	5
Avg.		10.78	75.8	815	5400	5400	36.8	36.8

ALBERTA RESEARCH COUNCIL

FOREST PRODUCTS LABORATORY

Table II-22

MOR & MOE DRY-Perpendicular
(CAN3-0437.1-M85)

Client: ARC
Test Date: Jan 15, 1987
Proj.Ref.: 303261-13261

Test Material: A1 (2.5% Resin)
Nom. Thickness: 11.1 mm
Conditioning: As Received
Span: 265.0 mm

Panel No.	Sample No.	Thick-ness	Width	Max. Load	MOE	Avg. MOE	MOR	Avg. MOR
		mm	mm	N	MPa	MPa	MPa	MPa
	4	11.16	75.8	971	5900		40.9	
A1-3	5	11.20	75.8	931	5300	5100	38.9	34.1
	6	11.34	75.8	555	4100		22.6	
	4	10.78	75.8	1119	5500		50.5	
A1-4	5	10.70	75.8	1035	6500	6500	47.4	50.7
	6	11.08	75.8	1271	7500		54.3	
	4	10.96	75.8	637	4800		27.8	
A1-5	5	10.62	75.8	1093	6500	5700	50.8	41.2
	6	10.60	75.8	961	5700		44.9	
	4	10.68	76.0	686	5000		31.5	
A1-8	5	10.46	75.8	683	5400	5100	32.7	31.4
	6	10.52	75.8	636	4900		30.1	
	4	10.98	75.8	862	6000		37.5	
A1-9	5	10.98	75.6	1243	7900	6600	54.2	41.0
	6	11.10	75.8	736	5900		31.3	
No.		15	15	15	15	5	15	5
Avg.		10.88	75.8	895	5800	5800	39.7	39.7

ALBERTA RESEARCH COUNCIL

FOREST PRODUCTS LABORATORY

Table II-23

Internal Bond
(CAN3-0437.1-M85)

Client: ARC
Test Date: Jan 14, 1987
Proj.Ref.: 303261-13261

Test Material: A1 (2.5% Resin)
Nom. Thickness: 11.1 mm
Conditioning: As Received

Panel No.	Sample Number	Sample Length	Sample Width	Maximum Load	Internal Bond Strength	Average For Panel
		mm	mm	N	MPa	MPa
A1-3	1	49.6	49.6	1621	0.659	0.701
	2	49.8	49.4	1699	0.691	
	3	49.8	49.4	1450	0.589	
	4	49.8	49.6	1748	0.708	
	5	49.8	49.4	1913	0.778	
	6	49.8	49.4	1921	0.781	
A1-4	1	49.8	49.4	1580	0.642	0.728
	2	49.8	49.4	1841	0.748	
	3	49.8	49.4	1854	0.754	
	4	49.8	49.4	1985	0.807	
	5	49.6	49.4	1524	0.622	
	6	49.6	49.4	1946	0.794	
A1-5	1	49.8	49.6	2134	0.864	0.769
	2	50.0	49.6	1948	0.785	
	3	49.8	49.4	1756	0.714	
	4	49.8	49.6	1840	0.745	
	5	49.8	49.6	1943	0.787	
	6	50.0	49.6	1787	0.721	
A1-8	1	50.0	49.4	1724	0.698	0.631
	2	50.0	49.4	1559	0.631	
	3	50.0	49.4	1495	0.605	
	4	50.0	49.4	1688	0.683	
	5	50.0	49.4	1314	0.532	
	6	50.0	49.4	1565	0.634	
A1-9	1	50.0	49.4	1888	0.764	0.768
	2	49.8	49.4	1936	0.787	
	3	49.8	49.6	1893	0.766	
	4	49.6	49.4	1839	0.751	
	5	49.8	49.4	2178	0.885	
	6	49.8	49.4	1607	0.653	
No.		30	30	30	30	5
Avg.		49.8	49.5	1770	0.719	0.719

ALBERTA RESEARCH COUNCIL

FOREST PRODUCTS LABORATORY

Table II-24

Bond Durability-MOR after 2 Hour Boil-Parallel
(CAN3-0437.1-M85)

Client: ARC
Test Date: Jan 19, 1987
Proj.Ref.: 303261-13261
Span: 265 mm

Test Material: A1 (2.5% Resin)
Nom. Thickness: 11.1 mm
Conditioning: 2 Hour Boil

Panel No.	Sample No.	Sample Thickness	Sample Width	Maximum Load	MOR	Average MOR for Panel
		mm	mm	N	MPa	MPa
	1	10.45	75.5	512	24.7	
A1-3	2	10.60	75.5	529	24.8	21.2
	3	10.95	75.5	320	14.1	
	1	10.75	76.0	377	17.1	
A1-4	2	10.45	75.5	401	19.3	18.2
	3	10.50	75.5	381	18.2	
	1	10.75	76.0	415	18.8	
A1-5	2	10.85	76.0	326	14.5	17.8
	3	11.30	76.0	494	20.2	
	1	11.30	75.5	425	17.5	
A1-8	2	10.90	75.5	512	22.7	18.7
	3	10.85	75.5	356	15.9	
	1	10.30	75.5	285	14.1	
A1-9	2	10.40	75.5	587	28.6	20.0
	3	10.65	75.5	374	17.4	
No.		15	15	15	15	5
Avg.		10.73	75.6	420	19.2	19.2

ALBERTA RESEARCH COUNCIL

FOREST PRODUCTS LABORATORY

Table II-25

Bond Durability-MOR after 2 Hour Boil-Perpendicular
(CAN3-0437.1-M85)

Client: ARC
Test Date: Jan 19, 1987
Proj.Ref.: 303261-13261
Span: 265 mm

Test Material: A1 (2.5% Resin)
Nom. Thickness: 11.1 mm
Conditioning: 2 Hour Boil

Panel No.	Sample No.	Sample Thickness	Sample Width	Maximum Load	MOR	Average MOR for Panel
		mm	mm	N	MPa	MPa
	4	11.00	76.0	445	19.2	
A1-3	5	11.10	75.5	551	23.5	20.8
	6	11.20	75.5	465	19.5	
	4	10.70	76.0	400	18.3	
A1-4	5	10.70	76.0	525	24.0	19.1
	6	10.75	76.0	335	15.2	
	4	10.85	76.0	474	21.1	
A1-5	5	10.85	76.0	463	20.6	19.3
	6	10.55	76.0	346	16.3	
	4	10.85	76.0	402	17.9	
A1-8	5	10.60	76.0	486	22.6	21.4
	6	10.45	76.0	498	23.9	
	4	10.70	75.5	349	16.0	
A1-9	5	10.90	75.5	489	21.7	20.3
	6	11.05	76.0	539	23.1	
No.		15	15	15	15	5
Avg.		10.82	75.9	451	20.2	20.2

ALBERTA RESEARCH COUNCIL

FOREST PRODUCTS LABORATORY

Table II-26

Thickness Swell
(CAN3-0437.1-M85)

Client: ARC
Test Date: Jan 11, 1987
Proj. Ref.: 303261-13261

Test Material: A1 (2.5% Resin)
Nom. Thickness: 11.1 mm
Conditioning: 24 hr. Soak

Panel No.	Sample No.	Dry Thickness Position 1	2	3	4	Wet Thickness Position 1	2	3	4	Average Thick. Swell
		mm	mm	mm	mm	mm	mm	mm	mm	%
A1-3	1	11.10	10.85	10.85	10.90	12.85	13.35	12.15	12.55	17
	2	11.05	11.05	11.15	11.10	12.80	12.65	13.05	13.20	
A1-4	1	10.70	10.70	10.65	10.70	12.45	13.15	13.05	12.45	19
	2	11.35	11.55	11.50	11.25	13.40	14.05	13.65	13.25	
A1-5	1	11.25	11.10	10.80	11.05	13.30	12.80	13.20	12.80	20
	2	10.35	10.35	10.45	10.35	13.10	12.10	11.80	13.50	
A1-8	1	11.00	11.00	10.85	10.85	12.40	13.35	12.25	13.80	19
	2	11.10	10.95	11.05	11.20	13.15	13.15	12.95	13.70	
A1-9	1	10.75	10.70	10.55	10.60	11.85	12.25	12.70	12.60	20
	2	10.95	10.05	11.00	11.00	12.55	13.50	12.45	14.40	
No.		10	10	10	10	10	10	10	10	5
Avg.		10.96	10.83	10.89	10.90	12.79	13.04	12.73	13.23	19

ALBERTA RESEARCH COUNCIL

FOREST PRODUCTS LABORATORY

Table II-27

Linear Expansion-Oven Dry to Saturated
(CAN3-0437.1-M85)

Client: ARC
Test Date: Jan 16, 1987
Proj. Ref.: 303261-13261

Test Material: A1 (2.5% Resin)
Nom. Thickness: 11.1 mm
Conditioning: OD to Saturated

Panel No.	Sample No.		Oven Dry Gauge Length		Vac.-Pressure Gauge Length		Linear Expansion		Avg. Linear Expansion	
	Par.	Perp.	Par.	Perp.	Par.	Perp.	Par.	Perp.	Par.	Perp.
			mm	mm	mm	mm	%	%	%	%
A1-3	1	3	250.00	250.45	250.55	251.05	0.22	0.24	0.21	0.24
	2	4	250.70	249.25	251.20	249.85	0.20	0.24		
A1-4	1	3	249.35	249.75	249.90	250.25	0.22	0.20	0.18	0.18
	2	4	249.25	250.30	249.60	250.70	0.14	0.16		
A1-5	1	3	251.20	249.75	251.70	250.30	0.20	0.22	0.23	0.19
	2	4	250.90	250.40	251.55	250.80	0.26	0.16		
A1-8	1	3	250.35	249.95	251.00	250.45	0.26	0.20	0.24	0.17
	2	4	249.80	249.45	250.35	249.80	0.22	0.14		
A1-9	1	3	250.30	249.40	250.75	249.95	0.18	0.22	0.19	0.25
	2	4	249.40	250.05	249.90	250.75	0.20	0.28		
No.			10	10	10	10	10	10	5	5
Avg.			250.15	249.90	250.65	250.40	0.21	0.21	0.21	0.21

ALBERTA RESEARCH COUNCIL

FOREST PRODUCTS LABORATORY

APPENDIX III

Data Summary - Black Poplar

Table III-1

Thickness Tolerance
(CAN3-0437.1-M85)

Client: ARC
Test Date: Jan 15, 1987
Proj. Ref: 303261-13261

Test Material: BP3 (1.5% Resin)
Nom.Thickness: 11.1 mm
Conditioning: As Received

Thickness Measurement		Panel No. B3-1 mm	B3-2 mm	B3-3 mm	B3-4 mm	B3-5 mm
Position 1		11.15	11.05	11.35	10.30	10.65
Position 2		10.80	10.60	11.25	10.45	10.40
Position 3		11.00	10.60	11.70	10.95	10.65
Position 4		11.00	10.60	11.55	11.00	10.50
Position 5		11.25	10.65	11.65	11.20	10.30
Position 6		10.90	10.65	11.25	10.75	10.50
Position 7		11.50	11.00	11.20	10.50	10.65
Position 8		11.30	11.00	11.30	10.35	10.55
Avg. Panel Thickness		11.10	10.75	11.40	10.70	10.55
Dev. of Average Panel Thickness from Nominal		0.00	-0.35	0.30	-0.40	-0.55
Range	High	11.50	11.05	11.70	11.20	10.65
	Low	10.80	10.60	11.20	10.30	10.30
Dev. Within Panel from Average	High	0.40	0.30	0.30	0.50	0.10
	Low	-0.30	-0.15	-0.20	-0.40	-0.25

ALBERTA RESEARCH COUNCIL

FOREST PRODUCTS LABORATORY

Table III-2

Moisture Content and Density
(CAN3-0437.1-M85)

Client: ARC
Test Date: January 26,1987
Proj. Ref.: 303261-13261

Test Material: BP3 (1.5% Resin)
Nom. Thickness: 11.1
Conditioning: Oven Dry& at Test

Panel No.	Sample No.	Length	Width	Thick-ness	TEST Weight	O.D. Weight	M.C.	Avg. M.C.	Density at Test	Avg. Density at Test
		mm	mm	mm	g	g	%	%	kg/cu.m	kg/cu.m
	1	76.0	76.0	10.90	39.5	38.7	2		627	
BP3-1	2	76.0	76.0	10.80	38.3	37.4	2	2	614	621
	1	76.0	76.0	10.70	42.4	41.4	2		686	
BP3-2	2	76.0	76.0	10.50	39.9	38.9	3	3	658	672
	1	76.0	76.0	11.20	45.0	44.3	2		696	
BP3-3	2	76.0	76.0	11.50	44.1	43.3	2	2	664	680
	1	76.0	76.0	10.60	41.7	41.1	1		681	
BP3-4	2	75.5	76.0	10.85	39.8	39.1	2	2	639	660
	1	76.0	76.0	10.55	40.3	39.7	2		661	
BP3-5	2	76.0	76.0	10.50	39.1	38.4	2	2	645	653
No.		10	10	10	10	10	10	5	10	5
Avg.		76.0	76.0	10.81	41.0	40.2	2	2	657	657

ALBERTA RESEARCH COUNCIL

FOREST PRODUCTS LABORATORY

Table III-3

MOR & MOE DRY-Parallel
(CAN3-0437.1-M85)

Client: ARC
Test Date: Jan 22, 1987
Proj.Ref.: 303261-13261

Test Material: BP3 (1.5% Resin)
Nom. Thickness: 11.1 mm
Conditioning: As Received
Span: 265.0 mm

Panel No.	Sample No.	Thick-ness	Width	Max. Load	MOE	Avg. MOE	MOR	Avg. MOR
		mm	mm	N	MPa	MPa	MPa	MPa
	1	11.00	75.8	544	4400		23.6	
B3-1	2	11.06	75.8	560	3900	4200	24.0	24.7
	3	11.12	75.8	622	4300		26.4	
	1	10.82	75.8	808	5300		36.2	
B3--2	2	10.84	75.8	498	4000	4700	22.2	28.1
	3	10.90	75.8	589	4700		26.0	
	1	11.30	75.8	583	3400		23.9	
B3-3	2	11.28	75.8	771	5100	4500	31.8	29.6
	3	11.24	75.8	799	4900		33.2	
	1	10.44	75.8	691	4700		33.2	
B3-4	2	10.46	75.8	703	5200	5100	33.7	34.7
	3	10.54	75.8	787	5400		37.2	
	1	10.60	75.8	772	5500		36.0	
B3-5	2	10.62	75.8	924	6400	5300	43.0	37.0
	3	10.60	75.6	684	4000		32.0	
No.		15	15	15	15	5	15	5
Avg.		10.85	75.8	689	4800	4800	30.8	30.8

ALBERTA RESEARCH COUNCIL

FOREST PRODUCTS LABORATORY

Table III-4

MOR & MOE DRY-Perpendicular
(CAN3-0437.1-M85)

Client: ARC
Test Date: Jan 22, 1987
Proj.Ref.: 303261-13261

Test Material: BP3 (1.5% Resin)
Nom. Thickness: 11.1 mm
Conditioning: As Received
Span: 265.0 mm

Panel No.	Sample No.	Thick-ness	Width	Max. Load	MOE	Avg. MOE	MOR	Avg. MOR
		mm	mm	N	MPa	MPa	MPa	MPa
	4	10.92	75.6	842	5300		37.1	
B3-1	5	10.96	75.8	762	4800	5000	33.3	33.9
	6	11.12	75.8	735	4900		31.2	
	4	10.60	75.8	809	5100		37.8	
B3-2	5	10.50	75.8	822	6000	5400	39.1	36.6
	6	10.62	75.8	708	5200		32.9	
	4	11.30	75.8	810	5300		33.3	
B3-3	5	11.42	75.8	692	4600	4600	27.8	28.8
	6	11.60	75.8	648	4000		25.3	
	4	10.84	75.8	626	4800		27.9	
B3-4	5	11.00	75.8	791	5200	5200	34.3	31.3
	6	11.10	75.8	747	5500		31.8	
	4	10.52	75.8	665	4700		31.5	
B3-5	5	10.58	75.6	793	5400	5100	37.2	34.1
	6	10.58	75.8	718	5300		33.6	
No.		15	15	15	15	5	15	5
Avg.		10.91	75.8	745	5100	5100	32.9	32.9

ALBERTA RESEARCH COUNCIL

FOREST PRODUCTS LABORATORY

Table III-5

Internal Bond
(CAN3-0437.1-M85)

Client: ARC
Test Date: Jan 22, 1987
Proj.Ref.: 303261-13261

Test Material: BP3 (1.5% Resin)
Nom. Thickness: 11.1 mm
Conditioning: As Received

Panel No.	Sample Number	Sample Length	Sample Width	Maximum Load	Internal Bond Strength	Average For Panel
		mm	mm	N	MPa	MPa
B3-1	1	49.6	49.8	966	0.391	0.428
	2	49.8	49.4	1046	0.425	
	3	49.6	49.8	1044	0.423	
	4	49.8	49.4	1211	0.492	
	5	50.0	49.6	1019	0.411	
	6	49.8	49.6	1048	0.424	
B3-2	1	49.8	49.4	1250	0.508	0.505
	2	49.8	49.2	1075	0.439	
	3	49.8	49.4	1382	0.562	
	4	49.8	49.4	1254	0.510	
	5	49.4	49.6	1290	0.526	
	6	49.6	49.4	1189	0.485	
B3-3	1	49.8	49.4	1130	0.459	0.484
	2	49.8	49.4	1174	0.477	
	3	49.8	49.4	1060	0.431	
	4	49.8	49.4	1340	0.545	
	5	49.6	49.4	1350	0.551	
	6	49.6	49.4	1083	0.442	
B3-4	1	49.4	49.8	1256	0.511	0.515
	2	49.4	49.6	1212	0.495	
	3	49.4	49.8	1378	0.560	
	4	49.2	49.6	1265	0.518	
	5	49.2	49.8	1089	0.444	
	6	49.2	49.6	1367	0.560	
B3-5	1	49.4	49.8	1047	0.426	0.416
	2	49.4	49.8	1097	0.446	
	3	49.6	49.8	867	0.351	
	4	49.4	49.8	704	0.286	
	5	49.4	49.8	1145	0.465	
	6	49.4	49.6	1284	0.524	
No.		30	30	30	30	5
Avg.		49.6	49.6	1150	0.470	0.470

ALBERTA RESEARCH COUNCIL

FOREST PRODUCTS LABORATORY

Table III-6

Bond Durability-MOR after 2 Hour Boil-Parallel
(CAN3-0437.1-M85)

Client: ARC
Test Date: Jan 22, 1987
Proj.Ref.: 303261-13261
Span: 265 mm

Test Material: BP3 (1.5% Resin)
Nom. Thickness: 11.1 mm
Conditioning: 2 Hour Boil

Panel No.	Sample No.	Sample Thickness	Sample Width	Maximum Load	MOR	Average MOR for Panel
		mm	mm	N	MPa	MPa
	1	10.98	75.6	329	14.3	
B3-1	2	11.08	75.8	504	21.5	18.5
	3	11.24	75.8	471	19.6	
	1	10.88	75.8	433	19.2	
B3-2	2	10.86	75.8	398	17.7	18.6
	3	10.94	75.8	431	18.9	
	1	11.30	75.8	417	17.1	
B3-3	2	11.28	76.0	506	20.8	17.9
	3	11.24	75.8	381	15.8	
	1	10.32	75.8	384	18.9	
B3-4	2	10.46	75.6	312	15.0	16.7
	3	10.52	75.8	342	16.2	
	1	10.62	75.6	351	16.4	
B3-5	2	10.56	75.6	462	21.8	19.3
	3	10.46	75.6	414	19.9	
No.		15	15	15	15	5
Avg.		10.85	75.7	409	18.2	18.2

ALBERTA RESEARCH COUNCIL

FOREST PRODUCTS LABORATORY

Table III-7

Bond Durability-MOR after 2 Hour Boil-Perpendicular
(CAN3-0437.1-M85)

Client: ARC
Test Date: Jan 21, 1987
Proj.Ref.: 303261-13261
Span: 265 mm

Test Material: BP3 (1.5% Resin)
Nom. Thickness: 11.1 mm
Conditioning: 2 Hour Boil

Panel No.	Sample No.	Sample Thickness	Sample Width	Maximum Load	MOR	Average MOR for Panel
		mm	mm	N	MPa	MPa
	4	10.90	75.8	409	18.1	
B3-1	5	10.88	75.8	421	18.7	18.6
	6	10.98	75.8	440	19.1	
	4	10.62	75.8	320	14.9	
B3-2	5	10.62	75.8	419	19.5	16.5
	6	10.56	75.6	324	15.3	
	4	11.20	76.0	359	15.0	
B3-3	5	11.32	75.8	446	18.3	16.7
	6	11.46	76.0	421	16.8	
	4	11.04	76.0	454	19.5	
B3-4	5	10.86	76.0	405	18.0	18.9
	6	10.70	76.0	420	19.2	
	4	10.48	75.8	385	18.4	
B3-5	5	10.52	75.8	352	16.7	19.0
	6	10.56	75.8	466	21.9	
No.		15	15	15	15	5
Avg.		10.85	75.9	403	17.9	17.9

ALBERTA RESEARCH COUNCIL

FOREST PRODUCTS LABORATORY

Table III-8

Thickness Swell
(CAN3-0437.1-M85)

Client: ARC
Test Date: Jan 22, 1987
Proj. Ref.: 303261-13261

Test Material: BP3 (1.5% Resin)
Nom. Thickness: 11.1 mm
Conditioning: 24 hr. Soak

Panel No.	Sample No.	Dry Thickness Position 1 (mm)	Dry Thickness Position 2 (mm)	Dry Thickness Position 3 (mm)	Dry Thickness Position 4 (mm)	Wet Thickness Position 1 (mm)	Wet Thickness Position 2 (mm)	Wet Thickness Position 3 (mm)	Wet Thickness Position 4 (mm)	Average Thick. Swell (%)
B3-1	1	11.00	11.00	10.90	10.90	14.40	13.70	14.15	13.85	29
	2	10.95	10.85	10.85	10.90	14.35	14.00	13.65	14.30	
B3-2	1	10.80	10.75	10.70	10.60	14.60	13.75	13.75	13.15	30
	2	10.60	10.50	10.45	10.55	14.20	13.95	13.30	14.00	
B3-3	1	11.20	11.15	11.15	11.20	14.20	13.25	13.75	13.50	25
	2	11.65	11.50	11.50	11.60	15.50	13.90	13.90	15.55	
B3-4	1	10.50	10.55	10.55	10.55	13.40	13.55	13.00	13.75	29
	2	10.90	10.85	10.90	10.95	14.40	14.00	14.40	14.40	
B3-5	1	10.45	10.45	10.45	10.50	13.35	13.35	13.50	14.00	30
	2	10.60	10.55	10.55	10.55	13.90	14.00	13.60	13.85	
No.		10	10	10	10	10	10	10	10	5
Avg.		10.87	10.82	10.80	10.83	14.23	13.75	13.70	14.04	29

ALBERTA RESEARCH COUNCIL

FOREST PRODUCTS LABORATORY

Table III-9

Linear Expansion-Oven Dry to Saturated
(CAN3-0437.1-M85)

Client: ARC
Test Date: Jan 26, 1987
Proj. Ref.: 303261-13261

Test Material: BP3 (1.5% Resin)
Nom. Thickness: 11.1 mm
Conditioning: OD to Saturated

Panel No.	Sample No.		Oven Dry Gauge Length		Vac.-Pressure Gauge Length		Linear Expansion		Avg. Linear Expansion	
	Par.	Perp.	Par.	Perp.	Par.	Perp.	Par.	Perp.	Par.	Perp.
			mm	mm	mm	mm	%	%	%	%
B3-1	1	3	249.10	249.30	249.55	249.85	0.18	0.22	0.20	0.21
	2	4	250.25	250.20	250.80	250.70	0.22	0.20		
B3-2	1	3	249.65	249.00	250.35	249.45	0.28	0.18	0.25	0.22
	2	4	249.45	248.65	250.00	249.30	0.22	0.26		
B3-3	1	3	249.30	249.25	250.10	249.75	0.32	0.20	0.28	0.19
	2	4	249.90	249.50	250.50	249.95	0.24	0.18		
B3-4	1	3	249.85	249.55	250.45	250.10	0.24	0.22	0.25	0.23
	2	4	248.45	249.35	249.10	249.95	0.26	0.24		
B3-5	1	3	249.60	250.40	250.00	250.90	0.16	0.20	0.20	0.19
	2	4	250.00	250.90	250.60	251.35	0.24	0.18		
No.			10	10	10	10	10	10	5	5
Avg.			249.55	249.60	250.15	250.15	0.24	0.21	0.24	0.21

ALBERTA RESEARCH COUNCIL

FOREST PRODUCTS LABORATORY

Table III-10

Thickness Tolerance
(CAN3-0437.1-M85)

Client: ARC
TestDate: Jan. 15, 1987
Proj. Ref: 303261-13261

Test Material: BP2 (2.0% Resin)
Nom.Thickness: 11.1 mm
Conditioning: As Received

Thickness Measurement		Panel No. BP2-2 mm	BP2-3 mm	BP2-4 mm	BP2-5 mm	BP2-6 mm
Position 1		10.55	10.65	10.85	11.00	10.90
Position 2		10.60	10.45	10.40	11.05	10.70
Position 3		11.15	10.80	10.60	11.75	11.20
Position 4		11.10	10.65	10.60	11.65	11.10
Position 5		11.35	10.90	10.95	11.80	11.35
Position 6		10.85	10.65	10.85	11.15	11.00
Position 7		10.80	10.85	11.05	11.10	11.10
Position 8		10.60	10.70	10.90	11.00	10.90
Avg. Panel Thickness		10.90	10.70	10.80	11.30	11.05
Dev. of Average Panel Thickness from Nominal		-0.20	-0.40	-0.30	0.20	-0.05
Range	High	11.35	10.90	11.05	11.80	11.35
	Low	10.55	10.45	10.40	11.00	10.70
Dev. Within Panel from Average	High	0.45	0.20	0.25	0.50	0.30
	Low	-0.35	-0.25	-0.40	-0.30	-0.35

ALBERTA RESEARCH COUNCIL

FOREST PRODUCTS LABORATORY

Table III-11

Moisture Content and Density
(CAN3-0437.1-M85)

Client: ARC
Test Date: January 26,1987
Proj. Ref.: 303261-13261

Test Material: BP2 (2.0% Resin)
Nom. Thickness: 11.1
Conditioning: Oven Dry& at Test

Panel No.	Sample No.	Length	Width	Thick-ness	TEST Weight	O.D. Weight	M.C.	Avg. M.C.	Density at Test	Avg. Density at Test
		mm	mm	mm	g	g	%	%	kg/cu.m	kg/cu.m
	1	76.0	76.0	10.70	41.1	40.1	2		665	
BP2-2	2	75.5	75.5	10.90	41.0	40.1	2	2	660	662
	1	75.5	76.0	10.65	40.4	39.8	2		661	
BP2 -3	2	76.0	76.0	10.55	37.6	36.8	2	2	617	639
	1	76.0	76.0	10.60	40.9	40.2	2		668	
BP2-4	2	75.5	75.5	10.55	41.8	41.1	2	2	695	682
	1	76.0	76.0	11.00	42.2	41.5	2		664	
BP2-5	2	76.0	76.0	11.35	41.2	40.5	2	2	628	646
	1	76.0	76.0	10.85	39.6	38.8	2		632	
BP2-6	2	76.0	76.0	10.85	41.1	40.3	2	2	656	644
No.		10	10	10	10	10	10	5	10	5
Avg.		75.9	75.9	10.80	40.7	39.9	2	2	655	655

ALBERTA RESEARCH COUNCIL

FOREST PRODUCTS LABORATORY

Table III-12

MOR & MOE DRY-Parallel
(CAN3-0437.1-M85)

Client: ARC
Test Date: Jan. 21, 1987
Proj.Ref.: 303261-13261

Test Material: BP2 (2.0% Resin)
Nom. Thickness: 11.1 mm
Conditioning: As Received
Span: 265.0 mm

Panel No.	Sample No.	Thick-ness	Width	Max. Load	MOE	Avg. MOE	MOR	Avg. MOR
		mm	mm	N	MPa	MPa	MPa	MPa
	1	10.48	75.8	674	4800		32.2	
BP2-2	2	10.60	76.0	736	5200	5100	34.3	32.3
	3	10.60	75.8	651	5300		30.4	
	1	10.48	75.8	504	3700		24.1	
BP2-3	2	10.66	75.6	769	4800	4600	35.6	29.5
	3	10.56	75.8	614	5300		28.9	
	1	10.54	75.8	633	4400		29.9	
BP2-4	2	10.62	75.6	737	5100	4900	34.4	34.8
	3	10.86	75.6	904	5300		40.3	
	1	10.88	75.6	766	4500		34.0	
BP2-5	2	10.92	75.8	669	4600	4900	29.4	32.0
	3	10.94	75.6	743	5500		32.6	
	1	10.74	75.8	839	4800		38.1	
BP2-6	2	10.82	75.8	713	5100	5000	31.9	33.7
	3	10.94	75.8	709	5000		31.1	
No.		15	15	15	15	5	15	5
Avg.		10.71	75.7	711	4900	4900	32.5	32.5

ALBERTA RESEARCH COUNCIL

FOREST PRODUCTS LABORATORY

Table III-13

MOR & MOE DRY-Perpendicular
(CAN3-0437.1-M85)

Client: ARC
Test Date: Jan 22, 1987
Proj.Ref.: 303261-13261

Test Material: BP2 (2.0% Resin)
Nom. Thickness: 11.1 mm
Conditioning: As Received
Span: 265.0 mm

Panel No.	Sample No.	Thick-ness	Width	Max. Load	MOE	Avg. MOE	MOR	Avg. MOR
		mm	mm	N	MPa	MPa	MPa	MPa
	4	10.92	75.8	870	6300		38.3	
B2-2	5	10.94	75.8	699	4600	5300	30.6	36.0
	6	11.16	75.8	927	5000		39.0	
	4	10.62	75.8	511	4500		23.8	
B2-3	5	10.74	75.6	692	4900	4800	31.5	28.6
	6	10.72	75.6	669	4900		30.6	
	4	10.66	75.6	766	5300		35.4	
B2-4	5	10.66	75.6	719	4900	5100	33.3	34.3
	6	10.74	75.8	754	5000		34.3	
	4	11.22	75.8	1013	5600		42.2	
B2-5	5	11.50	75.8	766	4500	5000	30.4	33.6
	6	11.70	75.8	736	4800		28.2	
	4	10.94	75.4	538	4900		23.7	
B2-6	5	11.02	75.6	579	4200	4700	25.1	28.4
	6	11.18	75.6	865	5100		36.4	
No.		15	15	15	15	5	15	5
Avg.		10.98	75.7	740	5000	5000	32.2	32.2

ALBERTA RESEARCH COUNCIL

FOREST PRODUCTS LABORATORY

Table III-14

Internal Bond
(CAN3-0437.1-M85)

Client: ARC
Test Date: Jan. 20, 1987
Proj.Ref.: 303261-13261

Test Material: BP2 (2.0% Resin)
Nom. Thickness: 11.1 mm
Conditioning: As Received

Panel No.	Sample Number	Sample Length	Sample Width	Maximum Load	Internal Bond Strength	Average For Panel
		mm	mm	N	MPa	MPa
BP2-2	1	50.0	49.4	1305	0.528	0.490
	2	49.2	49.8	1030	0.420	
	3	49.4	49.8	1010	0.411	
	4	49.4	49.8	1357	0.552	
	5	49.4	49.8	1188	0.483	
	6	49.4	49.8	1347	0.548	
BP2-3	1	49.6	49.4	1342	0.548	0.517
	2	49.6	49.6	1064	0.432	
	3	49.8	49.6	1258	0.509	
	4	50.0	49.6	1432	0.577	
	5	49.6	50.0	1256	0.506	
	6	49.6	50.0	1305	0.526	
BP2-4	1	49.4	49.2	1239	0.510	0.496
	2	49.4	49.4	1029	0.422	
	3	49.4	49.4	1099	0.450	
	4	49.2	49.8	1308	0.534	
	5	49.4	49.8	1385	0.563	
	6	49.8	49.4	1219	0.496	
BP2-5	1	49.4	50.0	1005	0.407	0.479
	2	50.0	49.4	1262	0.511	
	3	49.4	50.0	1169	0.473	
	4	49.4	49.8	1171	0.476	
	5	49.4	49.8	1301	0.529	
	6	49.8	49.6	1179	0.477	
BP2-6	1	49.8	49.2	951	0.388	0.454
	2	49.4	49.8	1050	0.427	
	3	49.4	49.6	1068	0.436	
	4	49.2	49.6	1026	0.420	
	5	49.4	49.6	1236	0.504	
	6	49.2	49.4	1334	0.549	
No.		30	30	30	30	5
Avg.		49.5	49.6	1200	0.487	0.487

ALBERTA RESEARCH COUNCIL

FOREST PRODUCTS LABORATORY

Table III-15

Bond Durability-MOR after 2 Hour Boil-Parallel
(CAN3-0437.1-M85)

Client: ARC
Test Date: Jan 26,1987
Proj.Ref.: 303261-13261
Span: 265 mm

Test Material: BP2 (2.0% Resin)
Nom. Thickness: 11.1 mm
Conditioning: 2 Hour Boil

Panel No.	Sample No.	Sample Thickness	Sample Width	Maximum Load	MOR	Average MOR for Panel
		mm	mm	N	MPa	MPa
	1	10.52	75.8	344	16.3	
BP2-2	2	10.64	75.8	399	18.5	18.0
	3	10.66	75.8	418	19.3	
	1	10.52	75.8	412	19.5	
BP2-3	2	10.62	75.6	427	19.9	18.5
	3	10.64	75.6	345	16.0	
	1	10.60	75.6	460	21.5	
BP2-4	2	10.76	75.6	423	19.2	19.1
	3	10.80	75.6	369	16.6	
	1	10.86	75.6	362	16.1	
BP2-5	2	10.96	75.6	477	20.9	19.2
	3	11.04	75.6	475	20.5	
	1	10.80	75.8	477	21.4	
BP2-6	2	10.88	75.8	417	18.5	19.2
	3	11.00	75.8	407	17.6	
No.		15	15	15	15	5
Avg.		10.74	75.7	414	18.8	18.8

ALBERTA RESEARCH COUNCIL

FOREST PRODUCTS LABORATORY

Table III-16

Bond Durability-MOR after 2 Hour Boil-Perpendicular
(CAN3-0437.1-M85)

Client: ARC
Test Date: Jan 23,1987
Proj.Ref.: 303261-13261
Span: 265 mm

Test Material: BP2 (2.0% Resin)
Nom. Thickness: 11.1 mm
Conditioning: 2 Hour Boil

Panel No.	Sample No.	Sample Thickness	Sample Width	Maximum Load	MOR	Average MOR for Panel
		mm	mm	N	MPa	MPa
	4	10.80	75.8	465	20.9	
BP2-2	5	10.96	75.8	415	18.1	17.8
	6	11.04	75.8	332	14.3	
	4	10.60	75.8	496	23.1	
BP2-3	5	10.60	75.8	390	18.2	19.6
	6	10.68	75.8	382	17.6	
	4	10.56	75.8	299	14.1	
BP2-4	5	10.62	76.0	362	16.8	15.9
	6	10.60	76.0	364	16.9	
	4	11.12	75.8	479	20.3	
BP2-5	5	11.32	75.8	483	19.8	18.2
	6	11.52	75.8	370	14.6	
	4	10.90	75.6	386	17.1	
BP2-6	5	10.92	75.6	290	12.8	14.4
	6	11.08	75.6	312	13.4	
No.		15	15	15	15	5
Avg.		10.90	75.8	388	17.2	17.2

ALBERTA RESEARCH COUNCIL

FOREST PRODUCTS LABORATORY

Table III-17

Thickness Swell
(CAN3-0437.1-M85)

Client: ARC
Test Date: Jan. 20, 1987
Proj. Ref.: 303261-13261

Test Material: BP2(2.0% Resin)
Nom. Thickness: 11.1 mm
Conditioning: 24 hr. Soak

Panel No.	Sample No.	Dry Thickness Position 1	2	3	4	Wet Thickness Position 1	2	3	4	Average Thick. Swell
		mm	mm	mm	mm	mm	mm	mm	mm	%
BP2-2	1	10.70	10.70	10.70	10.75	13.20	13.35	12.25	13.40	22
	2	11.05	11.00	10.90	11.00	13.60	12.95	13.45	14.05	
BP2-3	1	10.60	10.65	10.60	10.60	12.40	12.95	13.00	12.95	22
	2	10.60	10.65	10.60	10.65	13.00	13.65	12.55	13.55	
BP2-4	1	10.75	10.70	10.55	10.65	12.90	12.50	12.15	12.35	18
	2	10.45	10.50	10.40	10.55	12.90	12.25	11.95	13.10	
BP2-5	1	11.10	11.00	11.00	11.10	13.80	13.00	13.85	13.25	23
	2	11.60	11.50	11.45	11.55	14.20	14.00	14.25	14.35	
BP2-6	1	10.95	10.90	10.90	10.90	13.20	12.95	12.70	12.90	21
	2	11.00	10.95	10.90	11.05	13.95	13.35	13.20	13.75	
No.		10	10	10	10	10	10	10	10	5
Avg.		10.88	10.86	10.80	10.88	13.32	13.10	12.94	13.37	21

ALBERTA RESEARCH COUNCIL

FOREST PRODUCTS LABORATORY

Table III-18

Linear Expansion-Oven Dry to Saturated
(CAN3-0437.1-M85)

Client: ARC
Test Date: Jan. 26, 1987
Proj. Ref.: 303261-13261

Test Material: BP2 (2.0% Resin)
Nom. Thickness: 11.1 mm
Conditioning: OD to Saturated

Panel No.	Sample No.		Oven Dry Gauge Length		Vac.-Pressure Gauge Length		Linear Expansion		Avg. Linear Expansion	
	Par.	Perp.	Par.	Perp.	Par.	Perp.	Par.	Perp.	Par.	Perp.
			mm	mm	mm	mm	%	%	%	%
BP2-2	1	3	249.50	249.60	249.90	249.95	0.16	0.14	0.17	0.17
	2	4	249.55	249.10	250.00	249.60	0.18	0.20		
BP2-3	1	3	249.90	250.05	250.50	250.55	0.24	0.20	0.21	0.20
	2	4	250.00	249.20	250.45	249.70	0.18	0.20		
BP2-4	1	3	250.35	249.80	250.80	250.30	0.18	0.20	0.16	0.18
	2	4	249.35	249.00	249.70	249.40	0.14	0.16		
BP2-5	1	3	249.10	249.80	249.55	250.25	0.18	0.18	0.19	0.21
	2	4	250.40	250.00	250.90	250.60	0.20	0.24		
BP2-6	1	3	250.05	248.70	250.40	249.10	0.14	0.16	0.20	0.20
	2	4	249.30	249.35	249.95	249.95	0.26	0.24		
No.			10	10	10	10	10	10	5	5
Avg.			249.75	249.45	250.20	249.95	0.19	0.19	0.19	0.19

ALBERTA RESEARCH COUNCIL

FOREST PRODUCTS LABORATORY

Table III-19

Thickness Tolerance
(CAN3-0437.1-M85)

Client: ARC
TestDate: Jan. 15, 1987
Proj. Ref: 303261-13261

Test Material: BP1 (2.5% Resin)
Nom.Thickness: 11.1 mm
Conditioning: As Received

Thickness Measurement		Panel No. BP1-1 mm	BP1-2 mm	BP1-3 mm	BP1-4 mm	BP1-5 mm
Position 1		10.50	10.85	10.70	11.15	10.75
Position 2		10.60	11.10	11.00	11.05	11.00
Position 3		10.45	11.00	10.75	10.55	11.00
Position 4		10.75	10.90	10.80	10.65	11.00
Position 5		11.45	11.20	11.05	11.10	11.45
Position 6		11.60	11.30	11.30	11.70	11.65
Position 7		11.40	11.25	11.25	11.95	11.55
Position 8		10.85	10.95	10.80	11.40	11.15
Avg. Panel Thickness		10.95	11.05	10.95	11.20	11.20
Dev. of Average Panel Thickness from Nominal		-0.15	-0.05	-0.15	0.10	0.10
Range	High	11.60	11.30	11.30	11.95	11.65
	Low	10.45	10.85	10.70	10.55	10.75
Dev. Within Panel from Average	High	0.65	0.25	0.35	0.75	0.45
	Low	-0.50	-0.20	-0.25	-0.65	-0.45

ALBERTA RESEARCH COUNCIL

FOREST PRODUCTS LABORATORY

Table III-20

Moisture Content and Density
(CAN3-0437.1-M85)

Client: ARC
Test Date: January 26,1987
Proj. Ref.: 303261-13261

Test Material: BP1 (2.5% Resin)
Nom. Thickness: 11.1
Conditioning: Oven Dry& at Test

Panel No.	Sample No.	Length	Width	Thick-ness	TEST Weight	O.D. Weight	M.C.	Avg. M.C.	Density at Test	Avg. Density at Test
		mm	mm	mm	g	g	%	%	kg/cu.m	kg/cu.m
	1	76.0	76.0	10.95	42.8	41.5	3		677	
BP1-1	2	76.0	76.0	10.60	41.4	39.8	4	4	676	676
	1	76.0	76.0	10.60	40.1	39.1	3		655	
BP1-2	2	76.0	76.0	10.90	47.4	46.1	3	3	753	704
	1	76.0	76.0	10.55	40.4	39.4	3		663	
BP1-3	2	76.0	76.0	10.70	42.8	41.5	3	3	693	678
	1	76.0	76.0	10.90	42.2	41.1	3		670	
BP1-4	2	76.0	76.0	10.65	40.3	39.2	3	3	655	663
	1	75.5	76.0	10.80	40.4	39.0	4		652	
BP1-5	2	76.0	76.0	11.05	46.4	44.6	4	4	727	689
No.		10	10	10	10	10	10	5	10	5
Avg.		76.0	76.0	10.77	42.4	41.1	3	3	682	682

ALBERTA RESEARCH COUNCIL

FOREST PRODUCTS LABORATORY

Table III-21

MOR & MOE DRY-Parallel
(CAN3-0437.1-M85)

Client: ARC
Test Date: Jan. 21, 1987
Proj.Ref.: 303261-13261

Test Material: BP1 (2.5% Resin)
Nom. Thickness: 11.1 mm
Conditioning: As Received
Span: 265.0 mm

Panel No.	Sample No.	Thick-ness	Width	Max. Load	MOE	Avg. MOE	MOR	Avg. MOR
		mm	mm	N	MPa	MPa	MPa	MPa
	1	10.50	75.8	732	5300		34.8	
BP1-1	2	10.80	75.8	670	4900	5100	30.1	33.1
	3	11.06	75.8	804	5200		34.5	
	1	10.82	75.6	757	4300		34.0	
BP1-2	2	10.64	75.6	708	5500	4800	32.9	31.3
	3	10.88	75.6	608	4500		27.0	
	1	10.76	75.8	818	4400		37.1	
BP1-3	2	10.62	75.6	656	5400	4800	30.6	32.7
	3	10.76	75.6	674	4500		30.6	
	1	11.06	75.8	736	4500		31.6	
BP1-4	2	11.02	75.8	676	4900	4800	29.2	30.5
	3	11.28	75.8	746	4900		30.7	
	1	10.82	75.6	868	5200		39.0	
BP1-5	2	10.78	75.6	757	4400	4800	34.3	37.4
	3	11.04	75.6	902	4800		38.9	
No.		15	15	15	15	5	15	5
Avg.		10.86	75.7	741	4800	4900	33.0	33.0

ALBERTA RESEARCH COUNCIL

FOREST PRODUCTS LABORATORY

Table III-22

MOR & MOE DRY-Perpendicular
(CAN3-0437.1-M85)

Client: ARC
Test Date: Jan. 22, 1987
Proj.Ref.: 303261-13261

Test Material: BP1 (2.5% Resin)
Nom. Thickness: 11.1 mm
Conditioning: As Received
Span: 265.0 mm

Panel No.	Sample No.	Thick-ness	Width	Max. Load	MOE	Avg. MOE	MOR	Avg. MOR
		mm	mm	N	MPa	MPa	MPa	MPa
	4	11.24	75.8	644	4600		26.7	
BP1-1	5	11.16	75.8	844	4300	4600	35.5	32.2
	6	11.10	75.8	808	5000		34.4	
	4	10.92	75.4	772	4900		34.1	
BP1-2	5	10.82	75.6	643	5700	5600	28.9	35.7
	6	11.06	75.6	1027	6100		44.1	
	4	10.84	75.8	891	5100		39.8	
BP1-3	5	10.70	75.6	630	4800	5100	28.9	35.1
	6	10.80	75.8	815	5400		36.6	
	4	10.98	75.6	717	4700		31.3	
BP1-4	5	10.76	75.8	792	5300	5000	35.9	32.0
	6	10.82	75.8	646	5100		28.9	
	4	11.18	75.8	730	4100		30.6	
BP1-5	5	10.98	75.8	625	4800	4600	27.2	31.2
	6	11.04	75.8	834	5000		35.9	
No.		15	15	15	15	5	15	5
Avg.		10.96	75.7	761	5000	5000	33.3	33.3

ALBERTA RESEARCH COUNCIL

FOREST PRODUCTS LABORATORY

Table III-23

Internal Bond
(CAN3-0437.1-M85)

Client: ARC
Test Date: Jan. 20, 1987
Proj.Ref.: 303261-13261

Test Material BP1 (2.5% Resin)
Nom. Thickness: 11.1 mm
Conditioning: As Received

Panel No.	Sample Number	Sample Length	Sample Width	Maximum Load	Internal Bond Strength	Average For Panel
		mm	mm	N	MPa	MPa
BP1-1	1	49.4	49.8	1200	0.488	0.492
	2	49.2	49.6	1364	0.559	
	3	49.4	49.8	1342	0.546	
	4	49.4	49.8	1223	0.497	
	5	49.2	49.6	1123	0.460	
	6	49.6	49.4	984	0.402	
BP1-2	1	49.4	49.8	1122	0.456	0.441
	2	49.4	49.8	1152	0.468	
	3	49.8	49.4	1281	0.521	
	4	49.6	49.2	873	0.358	
	5	49.4	49.6	1011	0.413	
	6	49.6	49.4	1060	0.433	
BP1-3	1	49.8	49.6	1265	0.512	0.459
	2	49.6	49.8	1345	0.545	
	3	49.4	49.6	1026	0.419	
	4	49.6	49.6	1044	0.424	
	5	49.6	49.6	985	0.400	
	6	49.8	49.4	1118	0.454	
BP1-4	1	49.8	49.6	1059	0.429	0.444
	2	49.6	49.8	1091	0.442	
	3	49.6	49.8	1391	0.563	
	4	49.8	49.6	914	0.370	
	5	49.8	49.6	1140	0.462	
	6	49.8	49.6	987	0.400	
BP1-5	1	50.0	49.6	1334	0.538	0.460
	2	50.0	49.6	1153	0.465	
	3	49.4	49.8	1054	0.428	
	4	50.0	49.4	987	0.400	
	5	49.8	49.4	994	0.404	
	6	49.4	49.8	1287	0.523	
No.		30	30	30	30	5
Avg.		49.6	49.6	1130	0.459	0.459

Table III-24

Bond Durability-MOR after 2 Hour Boil-Parallel
(CAN3-0437.1-M85)

Client: ARC
Test Date: Jan 26,1987
Proj.Ref.: 303261-13261
Span: 265 mm

Test Material: BP1 (2.5% Resin)
Nom. Thickness: 11.1 mm
Conditioning: 2 Hour Boil

Panel No.	Sample No.	Sample Thickness	Sample Width	Maximum Load	MOR	Average MOR for Panel
		mm	mm	N	MPa	MPa
	1	10.60	75.6	366	17.1	
BP1-1	2	10.92	75.6	375	16.5	16.8
	3	11.24	75.6	402	16.7	
	1	10.74	75.6	322	14.7	
BP1-2	2	10.76	75.8	356	16.1	16.8
	3	11.12	75.6	463	19.7	
	1	10.70	75.6	452	20.8	
BP1-3	2	10.64	75.6	357	16.6	16.8
	3	11.06	75.6	307	13.2	
	1	11.00	75.8	373	16.2	
BP1-4	2	11.10	75.8	364	15.5	16.9
	3	10.66	75.8	413	19.1	
	1	10.72	75.6	381	17.4	
BP1-5	2	10.92	75.4	433	19.1	17.0
	3	11.28	75.6	348	14.4	
No.		15	15	15	15	5
Avg.		10.90	75.6	381	16.9	16.9

ALBERTA RESEARCH COUNCIL

FOREST PRODUCTS LABORATORY

Table III-25

Bond Durability-MOR after 2 Hour Boil-Perpendicular
(CAN3-0437.1-M85)

Client: ARC
Test Date: Jan 23,1987
Proj.Ref.: 303261-13261
Span: 265 mm

Test Material: BP1 (2.5% Resin)
Nom. Thickness: 11.1 mm
Conditioning: 2 Hour Boil

Panel No.	Sample No.	Sample Thickness	Sample Width	Maximum Load	MOR	Average MOR for Panel
		mm	mm	N	MPa	MPa
	4	11.16	75.8	468	19.7	
BP1-1	5	11.14	76.0	437	18.4	20.0
	6	11.08	75.8	514	22.0	
	4	10.88	75.6	363	16.1	
BP1-2	5	10.86	75.4	508	22.7	18.2
	6	10.92	75.6	359	15.8	
	4	10.76	75.8	494	22.4	
BP1-3	5	10.70	75.8	329	15.1	19.0
	6	10.70	75.8	430	19.7	
	4	10.98	75.8	390	17.0	
BP1-4	5	10.94	75.8	369	16.2	18.7
	6	10.78	75.8	508	22.9	
	4	11.10	75.8	454	19.3	
BP1-5	5	11.10	75.8	330	14.0	17.0
	6	11.00	75.8	408	17.7	
No.		15	15	15	15	5
Avg.		10.94	75.8	424	18.6	18.6

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Table III-26

Thickness Swell
(CAN3-0437.1-M85)

Client: ARC
Test Date: Jan. 19, 1987
Proj. Ref.: 303261-13261

Test Material: BP1(2.5% Resin)
Nom. Thickness: 11.1 mm
Conditioning: 24 hr. Soak

Panel No.	Sample No.	Dry Thickness Position 1	2	3	4	Wet Thickness Position 1	2	3	4	Average Thick. Swell
		mm	mm	mm	mm	mm	mm	mm	mm	%
BP1-1	1	11.30	11.15	11.10	11.25	13.50	13.75	12.95	13.35	20
	2	10.80	10.75	10.75	10.75	13.00	13.30	13.00	12.50	
BP1-2	1	10.95	11.15	10.80	10.70	13.20	13.95	12.75	12.65	22
	2	10.95	10.95	10.95	11.05	13.80	12.90	13.25	13.90	
BP1-3	1	11.10	10.75	10.60	10.80	13.25	13.40	12.50	13.25	22
	2	10.80	10.70	10.75	10.70	13.10	13.15	13.15	13.65	
BP1-4	1	11.45	11.20	11.00	11.20	13.90	13.05	13.15	13.30	20
	2	10.60	10.60	10.60	10.60	13.35	12.30	12.85	12.85	
BP1-5	1	11.30	11.00	10.95	11.15	13.80	13.30	12.50	13.40	20
	2	10.95	11.00	10.90	10.95	13.00	13.50	13.50	12.75	
No.		10	10	10	10	10	10	10	10	5
Avg.		11.02	10.93	10.84	10.92	13.39	13.26	12.96	13.16	21

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Table III-27

Linear Expansion-Oven Dry to Saturated
(CAN3-0437.1-M85)

Client: ARC
Test Date: Jan. 26, 1987
Proj. Ref.: 303261-13261

Test Material: BP1 (2.5% Resin)
Nom. Thickness: 11.1 mm
Conditioning: OD to Saturated

Panel No.	Sample No.		Oven Dry Gauge Length		Vac.-Pressure Gauge Length		Linear Expansion		Avg. Linear Expansion	
	Par.	Perp.	Par.	Perp.	Par.	Perp.	Par.	Perp.	Par.	Perp.
			mm	mm	mm	mm	%	%	%	%
BP1-1	1	3	249.80	250.40	250.20	250.75	0.16	0.14	0.22	0.17
	2	4	249.20	248.80	249.90	249.30	0.28	0.20		
BP1-2	1	3	249.95	249.85	250.55	250.30	0.24	0.18	0.28	0.20
	2	4	249.15	248.20	249.95	248.75	0.32	0.22		
BP1-3	1	3	249.15	249.10	249.55	249.55	0.16	0.18	0.20	0.19
	2	4	250.05	248.75	250.65	249.25	0.24	0.20		
BP1-4	1	3	249.30	249.20	249.90	249.70	0.24	0.20	0.25	0.22
	2	4	249.25	250.00	249.90	250.60	0.26	0.24		
BP1-5	1	3	249.65	249.30	250.25	249.65	0.24	0.14	0.23	0.15
	2	4	248.90	250.15	249.45	250.55	0.22	0.16		
No.			10	10	10	10	10	10	5	5
Avg.			249.45	249.40	250.05	249.85	0.24	0.19	0.24	0.19

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